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Mechanical Criticisms.

Inventors or improvers sometimes prefer to allow their work to die before them, or to permit others to capture and re-enforce their ideas, rather than to make their work patent—or known—when by the laws of the country they would be defended against all meddlers. The surest way to a certain control of an improvement or the credit of an

SEWING MACHINE DRIVEN BY GAS MOTOR.

invention is to have it registered either by caveat or by the emission of letters patent. The man who would introduce a new mechanical device to the world makes a great mistake when he attempts to avoid criticism. For criticisms are not always unfriendly. The discussion of new inventions in the mechanical societies, while being very pointed and extremely critical, are of the most friendly nature. The very force of these discussions rests in their tendency to discover defects in methods and in the application of scientific principles.

The *Industrial World* says that "instead of sitting down to mope in anger over these animadversions, the inventor proceeds, if possible, to remove the cause which occasioned them. Thus, a rival has often unconsciously injured himself by attempting to injure his competitor, because he has suggested needful improvements in the other's journal. This rule holds good in the mechanical world. A rival says a certain machine is not good because it does not perform certain functions. The maker or inventor says, 'I will remedy this defect,' and proceeds to do so. The critic has helped to perfect the other's invention."

Barbs in Beef.

There is a fight going on in Chicago between the shippers of beef on the hoof and beef *per se* to the Eastern market. And as the shippers of dressed beef seem to have the encouragement of the market, the shippers of live beef appear to take advantage of every opportunity to decry the dressed beef enterprise. One of the queerest attempts to bring the dressed beef business into popular disfavor is the publication of two cases of injury to eaters of the beef by the swallowing of tag hooks affixed to the beef. These tag hooks are simply bent staples, three-quarters of an inch wide, and with prongs five-eighths of an inch long, used to secure the direction tags to the quarters of beef. The statement is that, in two weeks, two women residing in different parts of Philadelphia had swallowed these barbs in cooked beef, and both of them, by a curious coincidence, went to the same physician for relief.

Until further developments and other physicians are heard from, the impression made by these instances will be that the women must have had mouths like ostriches, and forgot to chew their meat.

Effects of Electricity upon the Nerves and Heart.

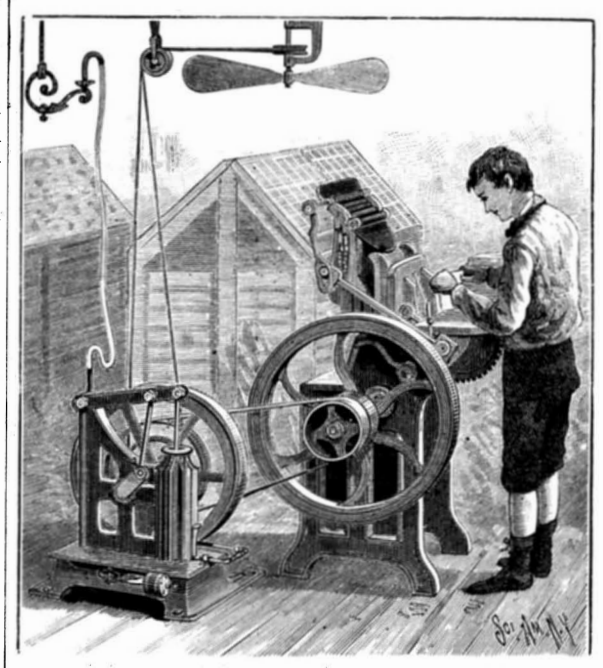
Among the curious exhibits at the Munich Electrical Exhibition were a series of photographs representing the various changes and contortions produced in the human face by subjecting the different facial nerves of a patient to the action of electricity. These were the experimental photographs made by Professor Von Ziemssen. The expressions of joy, pain, surprise, doubt, disgust, etc., were easily realized, according to the nerve that was touched by the electrode.

Other observations and experiments by Professor Von Ziemssen promise to be of great importance. They institute a comparison between the continuous and the induced current in the stimulation of the important accelerator and depresser nerves which control the heart. He has found that an induced current, so far from stimulating the nerves of the heart, as heretofore believed, is perfectly inoperative, whereas a continuous current from an ordinary battery is of the very greatest activity.—*Journal of the Telegraph.*

MOTORS FOR SMALL POWER.

Regarding the desirability of a compact, simple, easily managed, and inexpensive motor, little need be said. The want of it is manifest in various branches of manufacture and in all small mechanical industries, and the fact that motors of this class are not generally in use indicates that for one reason or another the want has not been fully met.

Our engravings show a motor recently developed by the Economic Motor Company, of 28 Beekman St., New York city, which is well calculated to meet the requirements of power users needing less than two horse power. It is a gas engine, deriving its power from the rapid ignition of a combustible mixture of illuminating or heating gas and air in the power cylinder. The gas and air enter the cylinder through valves that are entirely automatic in their action, and when the amount necessary to propel the piston has been drawn in the ignition takes place and the piston is pushed to the top of the cylinder, imparting rotary motion to the crank shaft and flywheel. The momentum of the



SMALL GAS ENGINE APPLIED TO PRINTING.

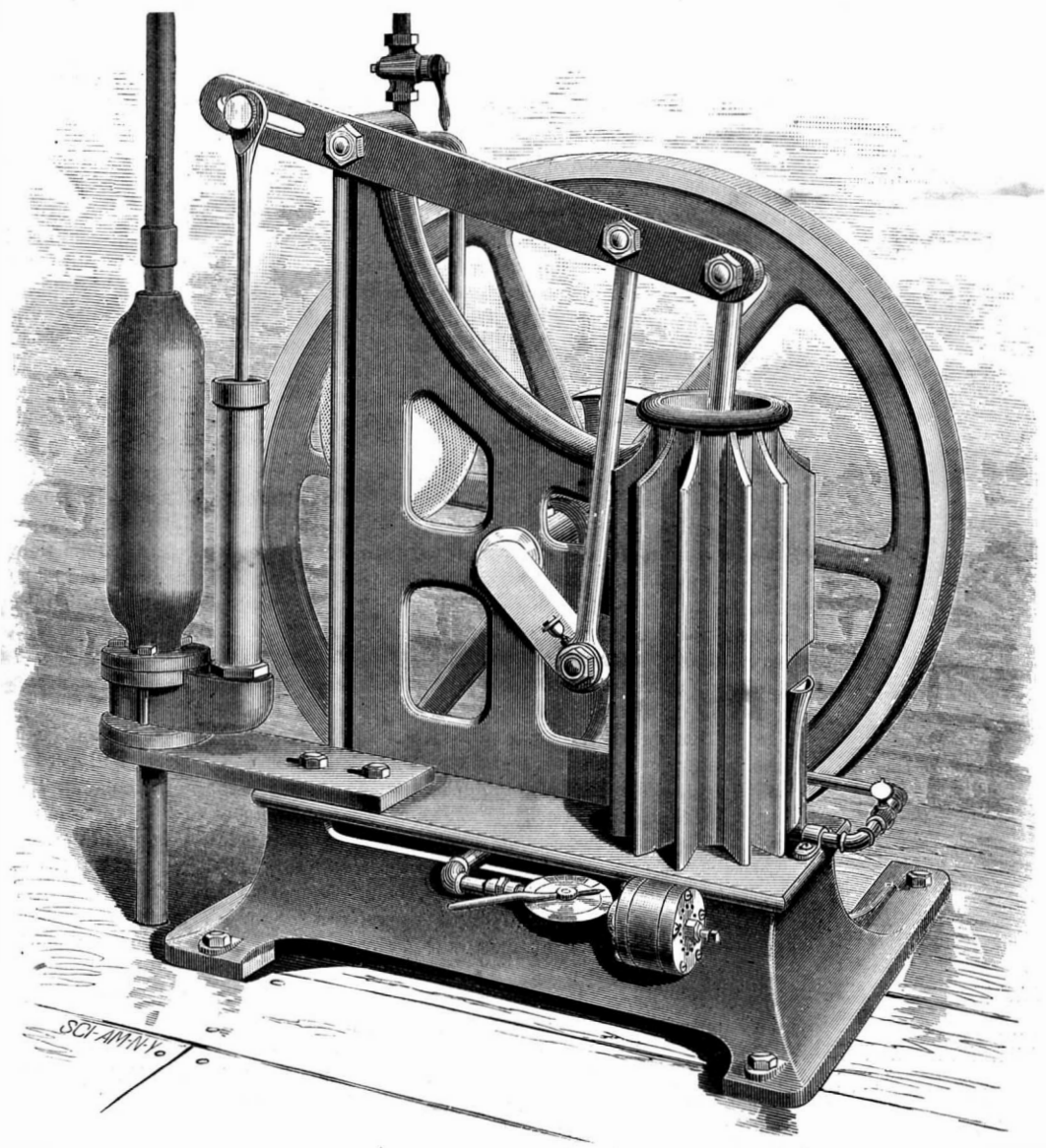
latter completes the revolution, driving out the products of combustion through the exhaust valve, when the gas and air enter as before and another ignition drives the piston up again, and so on as long as the gaseous fuel is supplied.

To start the engine it is only necessary to turn on the gas and light it at the ignition burner, and then turn the flywheel through a part of a revolution, when it moves on regularly. To stop the engine is simply to shut off the gas.

This motor requires no engineer to operate it, as any one can start and run it. As it can neither explode nor set fire to anything, it does not in any way affect insurance. No water is required in connection with it, and there is no expense attending bringing in the fuel. It produces neither ashes, dust, smoke, nor smell. It may be stopped or started as often as desirable, and when stopped expense ceases.

The one-half man power—the smallest size made—will run a sewing machine when taking its entire supply of gas through an ordinary six foot gas burner, and we are informed that for less than two cents per hour it will run two sewing machines, or a dentist's lathe, or other small machinery of a like character, or pump 150 gallons of water 50 feet high. The next size larger—one man power—is adapted to such work as running a foot lathe or scroll saw, dentist's machinery, foot power printing presses, pumping water, etc.; and a still larger engine—one-half horse power—is capable of running a small shop or three or four small printing presses, and is useful for hundreds of other purposes, which need not be named here.

This motor is patented in this country, also in England, France, Germany, Austria, Belgium, and Spain.



ECONOMIC MOTOR COMPANY'S GAS ENGINE APPLIED TO PUMPING.

THE yield of the Pennsylvania coal mines last year reached the enormous amount of 30,000,000 tons.

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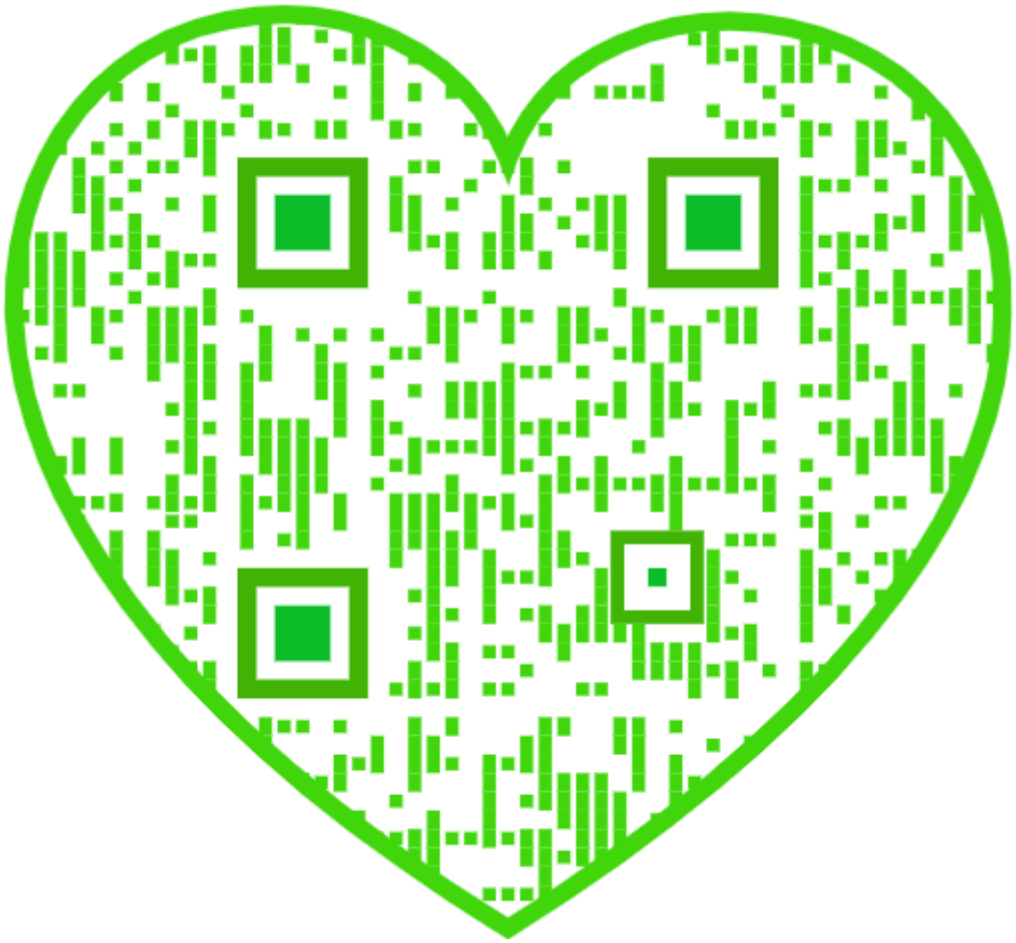

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NEW YORK, SATURDAY, SEPTEMBER 8, 1883.

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BORING DEEP WELLS BY WATER PRESSURE.

A new and great advance has been made in sinking deep well pipes, say from 100 to 300 feet or more in depth, in soil that will resist the sinking of the driven well pipe.

The hydraulic pressure system has been successfully applied at Adams, Mass., where six artesian wells are now flowing; one of 187 feet in depth, which was sunk in two hours; five wells of from 100 to 150 feet in depth, one of which has a 10 inch pipe, from which flows 400 gallons per minute under a head of 13 feet above the surface of the ground.

The method of sinking these wells is by the boring power of water under pressure—the pressure being obtained by a steam pump, or in places where a steam pump is not available a hand force pump answers the purpose. A peculiar feature was developed in the experiments made in perfecting this system, and the stern fact brought to light that a stream of water forced into the top of the pipe would keep an opening around the outside of the pipe for a depth of 40 or 50 feet, and would reopen the passage after stopping to put on an additional length of pipe; but after getting down to greater depths the stopping of the flow would allow the sand, gravel, and stones to settle down and wedge the pipe so tight that no available pressure could start it again. In the avoiding of this difficulty consists the novelty of this system. The placing in the line of pipe at every two or three lengths of a three-way cock with the use of two lines of hose gives a perfect control and steadiness of the flow down the pipe during the whole operation.

The hose being attached to the side outlet of the three-way cock, with the plug across the upper outlet until the section of pipe is sunk until the attached hose reaches the ground, when another section is added and another hose is attached to the next three-way cock as before, and the pressure of water put on, when the lower cock is turned so as to shut off the lower hose and continue the stream from the upper hose. In this way a depth of 200 or 300 feet may be attained without difficulty, possibly a much greater depth. A curious property of the power of water in keeping an open passage in an ascending current has been observed in these experiments. A plumb bob upon a line was dropped to a depth of 50 feet upon the outside of one of these pipes while in the process of sinking, and again hauled to the surface, showing that the current maintains a clear space around the outside of the pipe, probably for its whole depth—for in addition to this, the pipe is so loose in the hole that it can be turned around by the hand, and feeds itself down.

The author of this system is Jarvis B. Edson, of North Adams, Mass.

THE POTATO ROT.

At the time of writing, August 23, the daily papers contain telegraphic accounts of the great destruction of the potato crop in various sections of the country. The disease, judging from the descriptions, is doubtless the one known as the "potato rot." This is not a new trouble, and most of the older inhabitants can remember the ravages of this pest in 1842 and again in 1845, when it spread over Great Britain, Ireland, and the United States, causing much distress to those who make the potato the leading article of food.

The rotting of the potatoes is caused by a microscopic fungus, *Peronospora infestans*, which infests the potato plant.

By fungus is understood a plant of a very low order, the more familiar members of which are the toadstools, mushrooms, mildews, and moulds. Some of the fungi live only on decaying organic matter, and are comparatively harmless; in fact, are often helpful in hastening decay and preparing substances for future usefulness. Other species of fungi are parasitic, growing upon living things. The bread mould is a familiar illustration of a small fungus which feeds upon dead matter, while the potato rot fungus is an equally striking example of one thriving upon a living plant. The mildew of the grape, which has caused great damage in many vineyards, is a close relative of the potato rot. They both belong to the same genus (*Peronospora*), a genus which contains a large number of species, and all are destructive to the host plants.

The potato rot fungus consists of long filaments or threads, which grow through the substance of the potato plant, and rob it of juices and induce a rapid decay. The fungus usually makes its first appearance upon the under side of the leaves as frost-like patches, soon causing the foliage to curl and turn brown. This frost-like appearance is due to a multitude of spores which have formed upon the ends of fungus threads protruding from the breathing pores of the leaf. There are many thousand stomata or breathing pores to the square inch, and a dozen or more threads may come out at each opening. Each of these threads forms branches, and each branch bears a spore. This helps to give an idea of the vast number of spores formed upon a single affected leaf. These spores germinate quickly and in a peculiar manner—each spore giving rise to several smaller spores provided with hair-like appendages (*cilia*) by means of which they move quickly around. This is a most admirable provision for the rapid and perfect spreading of the disease when it has once "struck" a potato field.

After the foliage has become affected the disease passes into the stems and down to the tubers, when the most destructive work is done. The farmer should be on the watch for this fatal pest of his potato field. Like most fungi this Peronospora thrives best in warm, rainy, or "muggy" weather. In one of the recent press reports it was stated that the decay was caused by the wet weather which has prevailed in many parts of the country. The weather was only a favoring condition for the growth of the rot plant, as much so as the rains are aids to the profitable development of the various field crops. Weeks ago we predicted, and with a great degree of certainty, that the potatoes would rot in many sections. This came from a knowledge of the nature of the rot and the conditions which favor its development.

It has been shown that the disease is first seen upon the leaves. When the foliage begins to curl and turn brown, the potatoes should be dug at once, and in this prevent the fungus from reaching the tubers. The potatoes should then be placed in a cool and dry place—the conditions least favorable for the further growth of the fungus should it be present. All affected tubers should be thrown out and gathered with the vines and burned. This destroys multitudes of spores which might otherwise live through the winter and be ready to propagate the rot the following season.

There has been a great deal said about "rot proof" varieties of potatoes, but they probably do not exist. Some sorts are more susceptible than others, probably from constitutional weakness. Many prizes have been offered in England for the finding of the best sorts to withstand the attacks of the rot fungus, but without any satisfactory results. Knowing that the disease is caused by a parasitic fungus, the rapid development of which is favored by moist, warm weather, there is little hope of finding a variety of potatoes so abnormal as to be "rot proof."

CHEMISTRY FOR DIGESTION.

In all lands, and in all ages, the instinctive cravings of the human system have demanded and have eventually succeeded in obtaining as an article of food something which should give such a combination of nitrogen, carbon, and hydrogen with oxygen as is not readily accessible in any form of food of natural production. The savage, in temperate or cold climates, may subsist almost exclusively on flesh or fish, and in the tropical regions on vegetables and fruits, as they grow. But it is only the savage who does this. The first elevation from the savage state lifts him above such things and such simplicity of diet. He makes a combination, though without knowing the chemical reasons for it. The combination takes various forms and names, but it serves the same purpose, or aims to do so.

For us the name is *bread*, and no nations can be reckoned who have not been so dependent on that which has been to them what bread is to us, as that it should merit the name we so often give it, "The Staff of Life." And the more advanced the nation has become, the more has their type of bread grown into importance, and the more complete its preparation. The title of "bread winner" given to the supporter of the family but serves to show how absolutely the article is understood to satisfy the wants of the system.

We will not discuss the types as they exist in the present age, here and there throughout the world. Our purpose is a more practical one. It may do us no harm to just give a thought or two to *our* bread; to see what it is that we eat, and how near it comes to being the article which we fondly hope it is, and at any rate to consider what it ought to be, only supposing that human nature was honest.

We are very gravely told that our children should have bread and milk, or its equivalent, as the main article of their diet for the first four to six years after weaning, to the exclusion of almost everything else. Like a great many other of the sagacious plans for bringing up all children on one system by one rule, this may theoretically have some basis in truth. But alas! we are often disappointed. "Things are not what they seem," and while we flatter ourselves that the child is building up its strength and vigor, it is on the contrary only laying the foundation for a lifetime of weakness and suffering because of the very bread on which our hopes were placed. It is an actual fact, as all physicians of skill and experience now recognize, that in most of our families at the present time the *bread* is about the first article which needs watching in cases where weakness of digestion requires the observance of strict regimen in diet.

And it is also true that a very large part of the horrors of dyspepsia, of which we hear so much and from which a fearful proportion of the community are constantly suffering, are due in a great degree to *bread*, that is, to the various forms in which it comes to us, either under its own name or in the guise of its various substitutes—griddle cakes (*ad infinitum*, from buckwheat down—or up), hot biscuit, hot rolls, muffins, waffles, etc., etc. The evils which this array of breakfast diet especially have produced are already telling fearfully on the nation. To find a stomach thoroughly vigorous and perfect in its functions is in most classes and most communities an exception, and the bread supply has really been, and is, responsible for a large part of the evil.

In great measure this sad state of things has sprung from our rapid growth as a nation springing up in the wilderness. This has not only caused the national habit of eating rapidly, but has associated with it the equally widespread habit of preparing the bread food as rapidly, that is, extemporaneously, and consuming it on the instant. We have been taught to consider it scarcely hospitable to set before a guest at the breakfast table *cold* bread. If we cannot give him something *hot* with which to poison himself we apologize, and if the guest is an American he accepts the apology and is sorry for us—and for himself.

The evil result of this has become as truly national as the habit itself. A few words as to the chemistry which the matter of the hot bread involves may serve to set the evil

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and the danger in a clearer light. We will assume the bread in all cases to be made from a mixture of flour and water; we will say nothing of the other ingredients, for these two only are to the purpose. Such a mixture taken into the stomach in the state of a raw paste is almost absolutely indigestible. It becomes a solid mass, whose fermentation is full of danger. If on the contrary, it is cooked, say baked, it forms a firm, hard substance, which can be eaten, as we know, for a time, but which few persons choose to eat in continuance.

What we do, therefore, is to puff up the paste of flour and water by means of an elastic gas, and it is largely in the changes connected with this gas and its development that the evil resides. If it is formed properly, and the formation *finished*, wholesome bread is the result. There are, however, two sources of danger here indicated, only one of which we can at this moment consider—that is, that *the process is not completed.* Here is where the whole evil of hot bread in all its evil shapes reaches its culmination. The changes in chemical composition, with the molecular structure necessarily connected with them, which are required to transform paste into dough, do not cease when that dough is baked, and has thus become bread. They continue for quite a time afterward, and until they have entirely ceased the material has not become what it ought to be—bread easy of digestion. It is a burden to any stomach, to a weak one it is simply *poison.*

Here in few words is the source of unbounded difficulty and suffering. Hot bread, in any form whatever, ought never to be eaten. Some forms are very much worse than others, but all are bad, and should in reason be banished from every table. The manner in which the changes are wrought we may consider at another time.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BY H. C. HOVEY.

Looking over the register on this, the closing day of the Minneapolis meeting, I find it to contain only 321 arrivals, which is considerably less than the usual attendance. There were 186 new members and 60 fellows elected. The list of scientific papers read includes 166 communications, most of which elicited more or less discussion by the members. It cannot be expected that I should give even the mere titles of so many valuable contributions to science, much less an account of all the papers and all that was said about them. Intensely interesting as the mathematician might find a treatise on conic sections, or on the calculus of direction and position, it may be fairly presumed that the ordinary reader would turn to fields less dry. The same may be said of chemical treatises on gammadichlordibromopropionic acid, or of astronomical observations on the light variations of T Monocerotis. These and similar matters are highly important, but not easily made popular and entertaining.

Some of the sections, like that of statistics and economic science, for instance, actually found it difficult to get a fair hearing; while the sections of geology, biology, and anthropology were uncomfortably crowded. In selecting, therefore, a few papers as specimens of work done by the association the risk is run of choosing what attracted attention rather than what was really of greatest intrinsic excellence.

The most exciting theme in the section devoted to chemistry was, no doubt, that of "American Butters and their Adulteration," on which Prof. H. W. Wiley said that the false butters melt at about the same temperature as the true, hence a better test is by saturation, determining the amount of alcohol necessary to set the various fats free. The point of saturation is much lower for good than for poor butter. There is scarcely any soluble acid in the latter, while in the former it is about 5 per cent. The condition of the cows has also to be considered as to the production of the best butter. Oleomargarine shows a peculiar structure in polarized light. The curious fact was stated that oleomargarine had lately been made from cotton seed oil! The whole matter is receiving very careful attention from the United States Department of Agriculture.

Another paper that attracted attention was concerning the "Composition of American Wheat and Corn," by Prof. C. Richardson, of Washington, D. C. The results were tabulated of more than 200 analyses of wheat and 100 of corn. The wheats of the Atlantic States are poorest in nitrogen and albumen, and smallest in size. Those from New York are larger, but still inferior in nitrogen. Those of Maryland are the best among them. The wheats of the middle West are much larger, yet poor in quality. In Colorado, Minnesota, and Dakota we reach the most desirable wheat. The average amount of albumen in our cereals is: Wheat, 14·8; barley, 14·8; oats, 13·8–9; rye, 13·9–25; corn, 10. Corn is not so exhausting a crop as wheat, and will succeed where wheat fails.

Prof. J. C. Arthur described a poisonous aquatic weed found in the lakes of Minnesota in such quantities as to alarm the inhabitants by the sudden and mysterious mortality among their cattle and hogs. Observations as to the cause led to the discovery of a great number of minute balls, only one millimeter in diameter, with fine filaments, at the base of which the microscope disclosed small knobs containing a green liquid. These were found for a few weeks in May and June, and there was proof that cattle that drank the water in which they abounded died in a space of time varying from 20 minutes to 34 hours. The balls were a species of *Rivularia.*

Among the most interesting short papers was one by Prof. J. M. Coulter on "The Development of a Dandelion Flower," in which he traced the floral organs from the microscopic germ to their maturity, illustrating the subject by crayon sketches.

Prof. W. R. Dudley read an essay on the "Origin of the Flora of the Central New York Lake Region," from the Genesee River to the Oneida Lake. The whole region is a series of old eroded valleys filled with drift deposits and occasional lake basins. A large and varied flora characterized this region, whose natural habitat was variously situated to the southwest, west, and northwest. His conclusion was that the great lakes had formerly flowed through these old valleys and carried with them the several varieties of widely scattered plants that had been localized here. This theory was confirmed by the abrupt eastern limit of the peculiar flora.

Perhaps the most interesting of the many papers read in the Biological section was that by Dr. E. P. Howland, on the application of nitrous oxide and air, or oxygen, under pressure to produce anæsthesia. The application is made in condensed air chambers. The reason why nitrous oxide alone cannot be used in prolonged dental and surgical operations is that the blood does not obtain oxygen from it, hence asphyxia follows. Dr. Howland claimed to have administered this gas to over 30,000 persons, and he found the average time of producing anæsthesia to be about 50 seconds, and the average time till the return of consciousness two minutes. The longest period of unconsciousness was 35 minutes. This was effected by allowing the patient to breathe air and then inhale the nitrous oxide again before returning fully to consciousness, the interval varying from a quarter to half a minute. In experiments on animals it was found that death generally followed from breathing pure nitrous oxide for two and a half minutes. If air or oxygen is mixed with it, under ordinary pressure, it will not produce anæsthesia. But mixed with equal quantities of air and breathed from a gas bag in a condensed air chamber at 15 pounds pressure per square inch, or mixed with oxygen in proportion of 85 parts of nitrous oxide to 15 of oxygen, in a chamber where the pressure is five pounds to the square inch, the mixture can be breathed an indefinite length of time without danger or injury, producing perfect anæsthesia and also complete oxygenation of the blood.

The compression of the gas into smaller space enables the lungs to hold a sufficient quantity of each element to cause the desired effect. It has been found that by this process animals may be kept insensible for an indefinitely long period without disturbing their vital functions. The method has been applied successfully by various surgeons, and it is demonstrated that thus the progress and duration of anæsthesia may be regulated at will and with the utmost safety and precision. Dr. Howland illustrated his remarks by experiments on a living animal. No experiments have yet been made on man; but it would be perfectly safe to do so, and it may be regarded as certain that this method, now described for the first time in the United States, will shortly supersede the use of ether and chloroform.

Several valuable papers were read in the department of Anthropology. Mr. Wm. McAdams, a farmer in southern Illinois, who has for several years been delving amid the mounds, gave an interesting account of "The Great Mound of Cahokia," located between Alton and St. Louis, in the so-called American Bottom, where 200 mounds in all have been found, 72 of which are along the Cahokia Creek. The largest of these is 100 feet high, having two terraces, covering several acres and with a flat area on top of an acre and a half. It is built of black earth, pyramidal in shape, and in good preservation. Flint tools have been found in it, and an ax of white flint, smooth and polished as ivory. Opinions are divided as to the purpose of the mound, whether as the site of a temple or village. Other papers were read on the mounds and mound builders by Profs. West, Peet, Campbell, Mason, and Morse.

The chief interest, however, centered in Prof. Putnam's illustrated lecture on "Altar Mounds and their Contents." He explained the best methods of excavating mounds so as to make sure of getting all their contents, by means of a system of cross trenches. The mounds particularly described were found about five miles from Madisonville, Ohio. The diagrams showed the numerous artistic designs wrought out in constructing the mounds, and also the curious and unique objects found in them. There were perforated pearls, strings of bear's teeth, and ornaments of silver, copper, and iron. There were carved images, some of which resembled the Egyptian style of sculpture. In Prof. Putnam's opinion it is an error to suppose all the mound builders to be of one race, as much so as to say now that all men who build railroads are of one nation. There were many different kinds of Indian mounds, evidently built on different plans and for diverse purposes. The ancient mound builders probably belonged to the short-headed American Mongoloids.

By special request your correspondent repeated his illustrated lecture on "Subterranean Scenery," and he also read a paper on "Oyster Farming." The latter was discussed mainly with regard to what is being accomplished in the Connecticut portion of Long Island Sound, since the State boundary was fixed in 1879. Shell fish commissioners were appointed in 1881, by whom the oyster grounds were surveyed, and designated to applicants at the nominal price of $1.10 per acre. The progress of oyster culture can be realized if we note the fact that whereas, in 1880, the active extent of Connecticut beds, as stated by the census, was but 6,934 acres (aside from natural beds, which cover 5,000 more), there are in 1883 single oyster farms larger than that aggregate; and the State has sold to private growers more than 100,000 acres in all. With modern appliances oysters are actually cultivated at depths varying from 25 to 75 feet, and there is no reason why nearly all the Long Island Sound might not be made productive.

Passing by numerous minor topics, the chief questions of the Association were undoubtedly two, viz., concerning the theory of evolution, and as to glacial action. President Dawson initiated the discussion in his retiring address. His utterances were judicious and respectful in their tone, but so decidedly in opposition to the extreme evolutionists, as to kindle excitement and provoke replies. Besides papers in the Biological Section bearing on the subject, by several members, it was made the burden of a lengthy address by Prof. E. D. Cope in general session, and likewise of a public address by the same champion of the theory in one of the city churches. He holds that the doctrine of direct descent of organic species from pre-existent species, throughout the geologic record, is proved and certain. The process is from simple to complex forms of life. We are approaching a complete genealogy of all existing animals, including man. Facts confirm our belief that however constant species may appear to us now, they have been at some time variable.

Even the structural characters of genera, families, and orders are variable in parts of the system. The speaker passed from a consideration of extinct mammalia to that of man himself, whom he regarded as developed from a simian ancestry, although there were gaps yet to be filled. Evolution has proceeded along the line of profitable variation, and the extinction of so many species is due to the fact that they ceased to be beneficial.

We do not pause at the "survival of the fittest," but seek the origin of the fittest, and for this there is only one explanation, namely, the action of *mind.* If its movements have produced the structures under the influence of impacts, strains, etc., the relation of mind to the development of types becomes clear. It should be added, however, that some pronounced evolutionists do not regard mind as an attribute of matter (the position taken by Cope), but as distinct from and superior to it, and obeying laws of its own, leading to the conclusion that as design proves a designer, and creation a creator, so evolution proves an evolver. At all events, it must be conceded that, in one form or another, most members of the Association appear to hold to evolution, though not always attaching the same meaning to the term While some do not hesitate to speak of it as certainly demonstrated, others declare that it rests on no satisfactory evidence, and can, in the nature of things, never be proved; and probably the majority regard it merely as "a good working hypothesis."

On the grand question of glacial action, numerous papers were read, accompanied by discussion, in which the leading geologists of the country took part. The titles of some of these papers were as follows: "Glacial Canons;" "The Minnesota Valley in the Ice Ages;" "The Glacial Boundary between New Jersey and Illinois;" "The Terminal Moraine west of Ohio;" "The Glacial Dam at Cincinnati;" "The Kame Rivers of Maine;" "Evidences from New England against the Iceberg Theory of the Drift;" "The Eroding Power of Ice." And when I say that these were discussed by such men as Professors J. S. Newberry, J. D. Dana, Richard Owen, T. Sterry Hunt, J. P. Lesley, James Hall, E. T. Cox, Major Powell, T. C. Chamberlin, G. F. Wright, and N. H. Winchell it is evident that the interest created must have been very great. Dr. Dawson took ground against the origin of the drift in a great continental glacier, claiming that there was instead a wide glacial sea with Arctic currents and icebergs, with here and there local glaciers. The gantlet thus thrown down was lifted by those adhering to the notion of a continental glacier. The geological room became too crowded for comfort, and the closing discussions were held in the large Chapel of the University. Amid such opposing theories and conflicting facts, it was not easy for ordinary minds to find a satisfactory resting place; and the outcome of it all was probably but an accumulation of valuable material as to glacial action, to be made better use of hereafter in subsequent researches.

Concerning the general influence of the great scientific gathering amid the commercial scenes of the Northwest, there can be no doubt that good was done by bringing men of science face to face with men of secular enterprise, and the result was new enthusiasm for both.

The hospitality of Minneapolis was abundant, and was supplemented by the courteous attentions of its sister city, St. Paul. The graver duties of the Association were varied by excursions to Lake Minnetonka, the Falls of Minnehaha, the Dalles of St. Croix, and other points of local interest. Special visits were paid to the immense flour mills of Minneapolis. After the adjournment there were limited excursions to Manitoba and the Yellowstone Park. The next meeting will be held in Philadelphia, in the first week of September, 1884, and it is anticipated that the British Association will be present by a large delegation of its members. Prof. J. P. Lesley was chosen president for the ensuing year.

Minneapolis, August 24, 1883.

AN effort was made in the French Chamber to force the railroad companies to adopt a new pattern of cars, with alleyways through them, as in America, but this was defeated.

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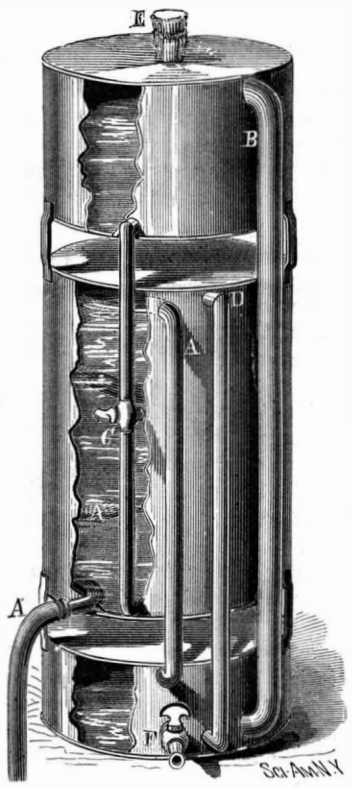
AUTOMATIC WATER STILL.

The illustration represents an automatic water still for the use of druggists, chemical laboratories, etc. The lower vessel is the boiler, the middle one the condenser tank, the upper one a supply tank. The boiler and supply tank are closed, except for the attached pipes, etc.; the condenser tank has a loose cover.

Of the four pipes shown, A is the steam and condensed water tube, coiled, as shown, in the condenser tank full of



HERRICK'S AUTOMATIC WATER STILL.

water, and delivering distilled water at A'; B is a pipe leading from the water level in the boiler to the top of the supply tank; C, a pipe, with cock, leading from the bottom of supply tank to the bottom of condenser tank; and D, a pipe leading from top of the condenser tank to bottom of boiler.

E is an opening, with airtight stopper, for filling supply tank, and F a cock to draw off hot water from boiler.

The supply tank and condenser tank being filled with water (through E, and the open top of condenser tank), E and the cock in C both closed, and the boiler empty, the cock in C is opened. Air has free access through A and B to the top of the supply tank; it therefore enters, and water flows out of supply tank into condenser tank through C. This displaces the water in the upper part of condenser tank, which flows through D into the boiler. This action continues till the water has risen in the boiler above the lower opening of B, thus cutting off the supply of air to condenser tank, and so the flow of water. Heat is then applied to the boiler in any convenient way, boiling soon begins, steam passes off through A and is condensed therein, and delivered as distilled water at A'.

When by evaporation the water level in the boiler is lowered so as to uncover the lower opening of B, the air again enters the supply tank through A and B, water flows through C, and the water at the top of the condenser tank, now heated by condensing the steam, passes over into the boiler till the lower opening of B is again closed. This action continues at intervals so long as water remains in the supply tank.

The advantages of this still are, that it is extremely simple, and always ready for use, upon simply filling, and heating; requires no setting up, no adjusting of tubes to a water supply for condensing. It requires very little heat, beginning to boil very soon after heat is applied, and utilizes waste heat as the process goes on. In the ordinary still the whole mass of water must be heated before steam is obtained; in this only a stratum less than an inch deep, which is replenished by hot water as it boils away, not stopping the boiling. It is entirely automatic; no attention is necessary from the time heat is applied till the supply tank is empty, or the water in the condenser tank all boiling hot. The supply tank can be refilled, if desired, without interrupting the boiling.

Hot water can be drawn from the boiler without interrupting the boiling, and with the result of increasing the amount of distilled water yielded. It is cheap; its first cost being much less than that of a still doing the same work, and the heat required being less, the cost of running is proportionately reduced. The size shown in cut, with boiler, etc., 6 inches in diameter, is the ordinary druggist's and physician's size, and will yield a quart of distilled water with no attention, and any required amount more by refilling the supply tank, and drawing off hot water from the boiler. Larger sizes are made for other uses. We are informed that a still with condenser tank 14 inches in diameter, and 14 inches high, has for six months furnished distilled water and hot water in abundance for from 10 to 17 students, in the laboratory of Iowa College, under the charge of the inventor.

The same principle, with slight modification, may be used for distilling other liquids.

This invention has been patented by W. H. Herrick, of Elizabethtown, N. Y.

Extent of the Natural Gas Supply.

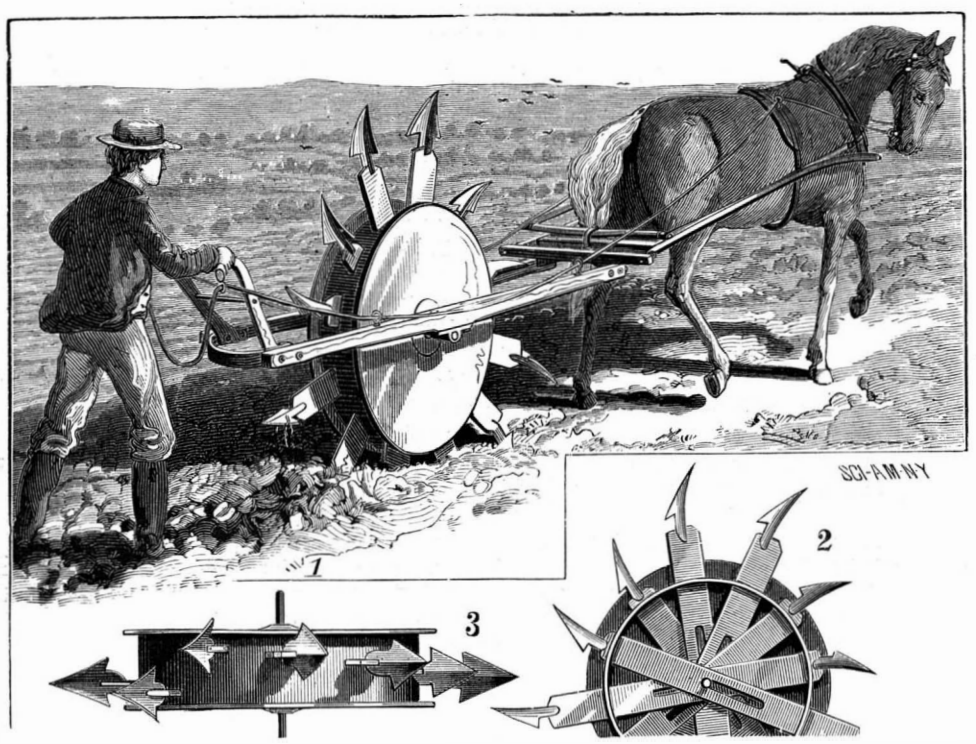
The great interest in the number of light and fuel companies led a reporter of a Pittsburg paper to have a talk with Mr. Asa P. Wilson, a gentleman who has had extended experience in drilling wells for oil and gas, and has a thorough knowledge of all the localities in the country in which gas especially can be found. He has made a study of the subject, and the result of his operations is that the gas territory is comparatively limited in extent, but Pittsburg lies near the belt where the greatest and most lasting flow of gas may be obtained.

Mr. Wilson, in describing the territory in which the greatest flow of gas may be obtained, says that it will be found within a belt extending from a point on Lake Ontario in a direct line to West Warren County, Pa., thence directly to Rochester, Pa., down through Steubenville, Wheeling, W. Va., Parkersburg, W. Va., to Boone County, W. Va., this line forming the northwestern boundary. A similar line running about eighty miles east, starting from Lake Ontario and ending after the Great Kanawha River is crossed, will embrace the area of the most productive gas territory. A continuation of this belt, but much narrowed, through Kentucky and Tennessee into Alabama will produce in many places large flows of gas. Sections of Wisconsin, Michigan, and Illinois are also likely to produce remunerative gas wells.

The points where the heaviest flows of gas may be expected, Mr. Wilson says, are Butler, Armstrong, Westmoreland, Greene, and Washington Counties, Pennsylvania; Brooke, Ohio, Marshall, Wetzell, and Monongalia Counties, West Virginia; and Belmont County, Ohio. "In such quantities can the gas be obtained in these sections," said Mr. Wilson, "that they are destined to be the great manufacturing districts of the country, especially in the iron and glass industries. But all along the belt, as experience is gained, I think that good and remunerative gas wells will be found with lasting flow."—*The Coal Trade Journal.*

IMPROVED ROTARY PLOW.

The novel rotary plow shown in the engraving might perhaps more properly be called a spader, as it imitates hand spading more nearly than it does plowing. It loosens and turns the soil in a very effective way, and, it is claimed, with less power than is ordinarily consumed in plowing. The plow has a heavy rotary drum carrying plowshares, and mounted in a suitable frame guided by handles, and drawn forward by horses in the usual manner. The drum is provided with a series of diametrical slots or mortises, in which are placed as many plow standards, each capable of sliding longitudinally through the drum and carrying at each end a plow. As the plow is drawn forward, the points enter the soil in succession, and remain there until the limit of the end motion of the standards is reached. At the same time they are tipped in the soil very much after the manner of hand spading. The plows may be made in various forms and several of them may be arranged side by side, forming gangs, which would accomplish a great amount of work with the application of a suitable amount of power. This plow could be very readily operated by steam either by means of the wire rope system or by traction engines.



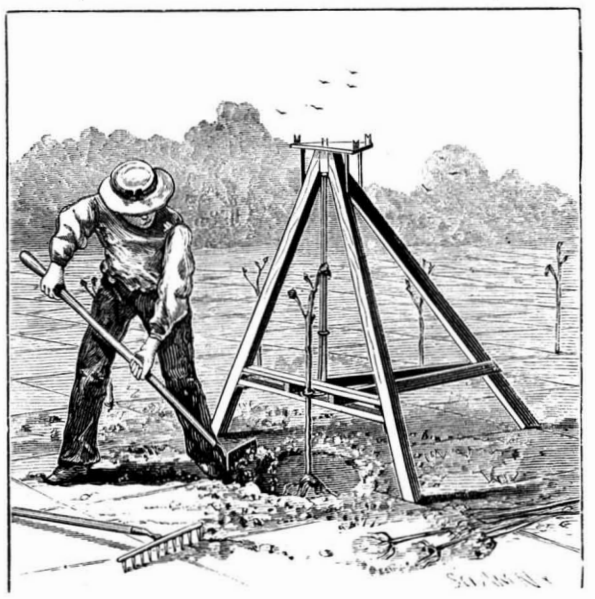
BETANCOURT'S ROTARY PLOW.

Figs. 2 and 3 of the engraving are enlarged detailed views of parts of the plow.

Further information in regard to this invention may be obtained by referring to our advertising columns, or addressing the patentee, Dr. G. A. Betancourt, care of Inventors' Institute, Cooper Union, New York city.

TREE PLANTER.

The engraving shows a novel device for holding trees at the proper elevation and in a vertical position while being planted. The planter has three inclined bars secured to



GAIRAUD'S TREE PLANTER.

each other at their upper ends, and connected by parallel and brace bars, forming a tripod, and provided with hanging springs having their lower ends bent forward and provided with claws, for suspending a tree in exactly the required position. To the upper end of the three inclined bars is attached a table provided with four sights, by which the planter can be adjusted from stakes at the sides of the field.

This invention has been patented by Mr. Louis Gairaud, of Santa Clara, Cal.

Bursting of a Steamboat Boiler.

The Hudson River way boat, Riverdale, plying between New York city and Haverstraw on the Hudson, with stoppages at intermediate points, was sunk by the bursting of a boiler on the afternoon of August 28. Four persons were known to have been killed and six injured, but the mortality list may be extended with the ascertained results of the wounded who were rescued, and the dead who may have gone down with the steamer.

It appears, from the statements of survivors, that the catastrophe was presaged by an unusual escape of steam through one of the deck gratings, but was followed almost immediately by an outburst that was accompanied by a dull roar, but not loud enough to disturb workmen on a pier not more than six hundred feet away.

But Inspector Dey, who ought to be good authority, says that this was not a burst on account of imperfect or worn out boiler plates, but an explosion because of the red heating of the boiler over the fire box by reason of the absence of water, and the pumping in of water on the surfaces of the red hot plates. Inspector Dey says that "under these circumstances it isn't a question of strength, for this is a power that upheaves mountains. How the water in the boiler should have been so greatly reduced without the knowledge of the engineer, of course I cannot say. The water gauge is not an infallible index; it may have become clogged, or it is possible even that for some reason it had been turned off without the engineer knowing it. The engineer certainly was deceived about the water in the boiler. No one familiar with steamboats will entertain the slightest doubt about the cause of the explosion."

Of course with such authority with positive opinions, it would be folly to assume any other hypothesis until the wreck is raised and an examination made of her boilers.

The New Money Order System.

The new postal money order notes, authorized under the law of the late Congress, will be ready for delivery at every money order post office September 3. They cover the transmission of all sums in dollars, and in fractions thereof, from a fraction of a dollar to five dollars.

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Cultivation of the Cinchona.

The republic of Guatemala has engaged Mr. Forsythe, a planter from Ceylon, to introduce into Guatemala half a million of the trees that bear the Peruvian bark, from which is distilled the salts known as quinine. Mr. Forsythe has ridden 1,000 miles through Central America in search of the best sites. He states that the rapid increase in the number of uses to which cinchona bark is put, not only for the manufacture of quinine and as an ingredient in the substitute for hops, but also for various commercial purposes, has led President Barrios to try this experiment.

LUMINOUS ATTACHMENT FOR HARNESS.

A novel application of luminous paint is illustrated in the accompanying engraving. The advantages of it will be

LUMINOUS ATTACHMENT FOR HARNESS.

apparent without special description. Any part of the harness, but preferably some part of the bridle, is coated with luminous paint, which is allowed to absorb light during the day and give it out during the night. This will render the parts thus treated visible, so that the position of the horse may be readily seen in the dark. As a modification of this device, the inventor proposes to treat some kind of a plate or tablet with luminous paint and attach it to the bridle or harness. Mr. Ernest F. Pflueger, of Akron, O., is the patentee of this invention.

How We Lived Forty Years Ago.

To go back forty years, fully as useful a contrast and as instructive a comparison may be made as to bring the early settler from England, Holland, and France in opposition to their descendants of two hundred years later. In 1843 and for some period thence onward, money, as currency, was scarce. Possibly general business suffered for want of the medium of exchange. Money, in bills or coin, had a value that would be looked upon now as almost a worshiping of a fetich. "One dollar a day" was "a good day's pay," and so it was considered even for fairly skillful labor. Several men, for instance, were employed in squaring, by chalk line and broad ax, the round timbers to form the framing of a dam. Others bored the holes for mortises and chiseled them out. Others did the "scribing," the sawing, and dressing of the tenons. Few of them got over one and a quarter dollars per day "from sunup to sundown." The man who could "scribe," and who laid out the job, got perhaps one dollar and fifty cents. The machinist got from one dollar and fifty to two dollars per day; and he who got the two dollars was a fortunate man; and for that time he was a competent man. Laborers had fifty cents per day, and in haying time, when several days' ordinary work must be crowded into twelve, fourteen, or possibly sixteen hours, they got seventy-five cents. Special workmen, apt at any jobs, one dollar.

Now this is a fair showing of the value of labor forty years ago. What was the relative value of housing, fuel, food, and clothing? Rents were low. A good house for the times cost from $25 to $40 per year. Fuel—wood—was somewhat less than it can be furnished, as coal now, at any place remote from the mines; say for an ordinary family six cords of hickory, $24; now four tons of coal (two fires), about equal. Food cost less forty years ago than now; but it was not the same food. Fresh meat once, or at most twice, a week, and rarely that except in "the killing season;" fish caught at the stream or pond, or hawked about at four cents a pound dressed. Vegetables from the garden, or from the market at twenty-five cents a bushel for potatoes and less prices for turnips. Onions almost as dear as now, and cabbages no cheaper. Clothing can be bought cheaper now than it could be forty years ago, and it is cheaper in more than one sense. Perhaps it would be better for the country at large if better clothing at higher prices should be the rule.

It is scarcely necessary to add to "how we lived forty years ago" any statement of how we live or how we might live now. It is enough to the present earner of his bread by labor to know of the annoyances and lack of opportunities of his predecessor. A glance over the condition of forty years ago and the present condition will convince any unprejudiced mind that an improvement has been made in the condition of our workers, and that the worker of to-day gets a better return for his labor than he did forty years ago. And this statement applies as nearly to the unskilled worker as to the adept mechanic. Only that the advantage now, as ever before, holds with the intelligent, skilled, experienced mechanic.

An Important Decision.

A decision has been handed down by Judge Blatchford as Circuit Judge of the Southern District of New York in the action of the Gramme Electrical Company against the Arnoux & Hockhausen Electrical Company, which was brought in equity for the infringement of letters patent granted to Zenobe Theophile Gramme and Eardley Koms Charles d'Ivernois, October 17, 1871, for seventeen years from that day for an improvement in magneto electric machines. It is set up for the defense that the patentees obtained a patent in Austria on December 30, 1871, and that an application was filed in the United States Patent Office on August 17, 1870. The court holds that as the Austrian patent expired at the latest on December 30, 1880, and before this suit was brought, and No. 120,057 continued to exist no longer, there was no ground for this suit in equity when it was brought. "The novelty of the invention patented is attacked, and it is also contended that the patent is invalid, because it was issued for a term of seventeen years and not for a shorter term. But the consideration of these questions is unnecessary, and the bill is dismissed with costs."

The Tornado at Rochester.

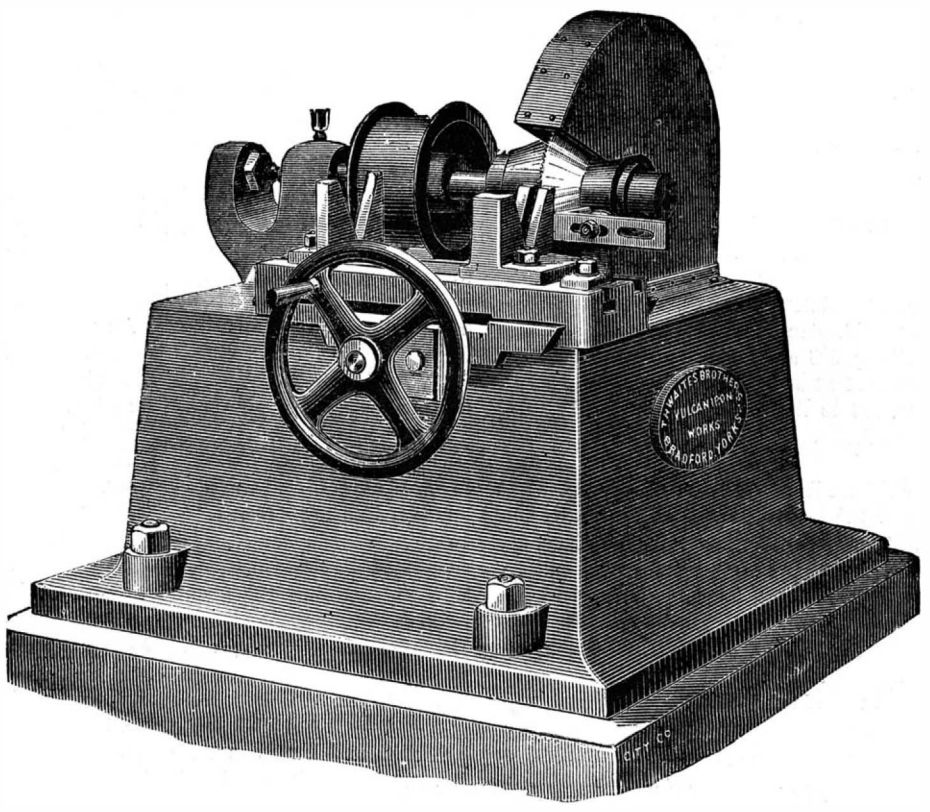
The wind that destroyed the town of Rochester, Minnesota, August 24, was attended with many remarkable results. On the grounds of F. A. Poole, opposite the court house, a curious freak of the storm is to be seen. A pine board, about six feet long and four inches wide, is driven endways through the trunk of a maple tree six inches thick, and remains embedded in it.

The wife of one farmer, who was in the field, started for the house, but failed to reach it. She ran for a stake in the field, but was blown almost to pieces. The stake was driven through her body, and her limbs torn off so that they have not yet been found.

The Hon. John McCall, of Winona, was killed near his elevator. He had started for the house, across the way, but had evidently been caught in the air and whipped on to the earth, for the grass was swept clean where he was found and every bone in his body was broken.

CIRCULAR SAW FOR HOT IRON.

We illustrate a circular saw for hot iron by Thwaites Brothers, of Bradford. It is a simple and handy tool, useful in a smith's shop, and capable of promoting economy in wages, fuel, and iron. The saws are made in different sizes



CIRCULAR SAW FOR HOT IRON.

from 21 to 36 inches diameter. The one exhibited at the Engineering Exhibition, and herewith illustrated, is 36 inches diameter. The saw is of the best steel, mounted upon a cast steel spindle, and runs, says *Iron*, at a speed of from 1,500 to 2,000 revolutions per minute. The bearings are of phosphor bronze, and the saw runs in a water trough which is formed in the bed. For sawing bars to dead lengths a moving slide is provided. The saw is covered in with a wrought iron guard. The bar is fed up to the saw on the slide rest by the hand wheel and quick threaded screw. The whole arrangement is compact, and the machine occupies but a small space.

What Constitutes a Carload.

Railroads do not exactly agree in their rules and estimates, but it is generally conceded that 6,000 feet of solid boards, 17,000 feet of siding, 13,000 feet of flooring, 40,000 shingles, one-half less hard lumber, one-quarter less green lumber, one-tenth less of joists, scantling, and all other large lumber constitute a carload. These figures are given by the *Southern Lumberman*, and approximate so closely to the general average that shippers will find them a great convenience as a matter of reference.

EAR TRUMPET AND CANE HANDLE.

The engraving shows a very compact form of ear trumpet which can be attached to a cane or umbrella stick as a handle. The sectional view shows how the trumpet is applied

EAR TRUMPET AND CANE HANDLE.

within the cane, the cane handle being provided with apertures which can be closed when the ear trumpet is not in use. An ear trumpet of this form is very portable, and may be used without attracting attention.

This invention has been patented by Mr. Henry Waldstein, of New York city.

Newport Natural History Society.

The General Assembly of Rhode Island, at its session of May, 1883, chartered the Newport Natural History Society for the purpose of establishing in Newport a museum of natural history, a zoological garden, and an aquarium. The society has been organized with seventy-one members, Professor Raphael Pumpelly being the president, George C. Mason, corresponding secretary, and Dr. J. J. Mason, curator.

Gas Poisoning.

Prof. M. Von Pettenkofer says it is a fact frequently proved that when a gas main breaks in the street, people in the nearest houses are frequently taken sick and may even die. At all events death results from the carbonic oxide, of which there is about 10 per cent in coal gas. It can always be detected in the blood of the sick or dead by Hoppe-Seyler's test. It is also a fact that such breaks are more dangerous in cold weather. The reason why more gas finds its way into the houses in winter than in summer is due only in part to the higher pressure on the gas during long winter nights, as well as the frozen soil above has less penetrability, but far more to the important fact, which can be proved experimentally, that in winter the interior of the house acts like a chimney upon the air in the ground and cellars.

Max Graeber had already established the minimum limit for injurious quantities of carbonic oxide in the air by a series of experiments upon animals, as 0·6 to 0·7 per thousand. There are decided symptoms of illness with 1·5 per thousand, which increase until it reaches 2 to 3·5 per thousand, without fatal results, even if such air is breathed for many hours. But when the quantity of carbonic oxide reaches 4 or 5 per thousand, fatal poisoning rapidly follows. Cramps set in with *opisthotonus*, and the animals soon cease to breath.

In one accident that occurred in Munich, where the room held 28 cubic meters (988 cubic feet) of air, 1·44 cubic meters (about 52 cubic feet) of coal gas sufficed, when mixed with the air, to reach 5 parts per million.

As a precaution against ground air contaminated with illuminating gas from entering houses, Von Pettenkofer recommends the police, the gas engineers, and private citizens to open all cellar windows as well as those on the ground floor of threatened houses, so as to prevent directly sucking in the ground air or render it harmless by dilution. Moreover, the smell of gas serves as a warning.—*Proceedings of the Munich Academy.*

It is said that dwarfs die of premature old age, and giants of exhaustion.

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THE UNIVERSITY OF STRASBOURG.

Germany intends to effect a moral conquest over her new province of *Reichsland* or Alsace-Lorraine as complete as its physical subjugation under her arms. Her success so far has not been flattering, but her designs are rational and are generously supported. She aims at throwing the higher education of the province into a German form and instilling patriotic zeal for the Fatherland into the hearts of her new beneficiaries. The University of Strasbourg has undergone a great change; it has been extended and transformed, and the German Government has expended a sum almost equal to $3,000,000 in its renovation and furnishment.

The University of Strasbourg was established in 1566 under the name of an academy; in 1621 Ferdinand II. erected it into a university, and the property of the Chapel of St. Thomas was assigned to it for the maintenance of its professors and its ordinary expenses. Of sixteen prebendaries, thirteen were occupied by the professors, each one of whom received fifty-two measures of wheat, fifty-six of rye, ten of barley—in all about one hundred and twenty-five hectoliters. The university was Protestant, but all creeds enjoyed its advantages in the courses of law, medicine, and philosophy.

The capitulation of 1681 delivered Strasbourg to France, and the rights and revenues of the university were entirely respected. It rapidly assumed French methods, and its faculty allied itself to French thought with alacrity and enthusiasm.

During the eighteenth century it enjoyed a great celebrity and offered an elaborate curriculum.

At the end of the last century the university was filled with students. Such eminent professors as Boehrig, Blessig, Louth, Schoepflin, Oberlin, Schweighauser, gathered about their chairs students of every nationality, among whom may be recalled Metternich, the Prince of Tremouille, Prince of Narbonne, of d'Argenson, of Segur, of Custine, and Goethe. The revolution suppressed the university.

In 1794 a school of sanitary science was instituted, which later became a faculty of medicine. The academy was established in 1806, the courses of law were opened in 1806, those in theology, belles-lettres, and science in 1810. The new faculties lasted until 1870, and counted among their members scholars of whom many are now illustrious. Duvernoy, Gerhardt, Schimper, Pasteur, Daubrée, Abbe Bautain, Saint-René Taillandier, M. Janet, Fustel de Coulanges, Aubry, Rau, Reuss, Colani, Sedillot, Schützenberger, Forget, Küss, figured in their brilliant lists. The professors had a high value, but the organization was defective.

Immense changes have been effected since the conquest of Alsace-Lorraine by the Germans in the historic seat of learning. It is difficult to recognize the original outlines amid the new and remarkable enlargements it has undergone. In place of the old academy inclosing a few halls and imperfect laboratories there is now a small town dedicated to the university needs. Here are the buildings for the schools of belles-lettres, of law, and science; the medical corps are gathered about the civic hospital, the faculty of theology will soon be established in new quarters, and the physical, chemical, and botanical laboratories, with the observatory, are completed and open to students.

The expenses incurred by Germany by this rehabilitation of the old university have been excessive. In all it amounts to about 11,200,000 marks, or about $3,000,000, contributed from the treasury of the empire in part, in part obtained by taxation from the province of Strasbourg, and the department of the Lower Rhine.

To-day in Germany there are 23 universities. Strasbourg is far from occupying the last rank, both in the number of its teachers and pupils. Munich has 72 regular professors, Berlin 68, and Strasbourg 64; 5,990 students are matriculated at Berlin, 3,399 at Leipsic, 2,276 at Munich, 1,646 at Breslau, 1,452 at Halle, 866 at Strasbourg, 723 at Heidelberg, 625 at Freibourg, 568 at Erlangen. Of the 866 students at Strasbourg 75 are assigned to the course of theology, 202 to the course of law, 211 to the course of medicine, 160 to the course of philosophy, 180 to the course of sciences.

The university is shunned by the natives of Alsace-Lorraine, who still regard with aversion and disdain the presence of the German jurisdiction in their midst, and their names are not frequent upon the lists of students.

A chair in the university is no sinecure. Each professor gives at least one lecture a day. M. Recklinghausen gives seven lessons a week and directs all the autopsies. M. Waldeyer gives each day a conference in neurology, three times a week a lecture upon general anatomy, and three lectures upon osteology and syndesmology. He moreover directs the histological studies. M. Goltz, professor of physiology, gives six lectures a week and controls the laboratory. M. Kundt and M. Fittig, who teach physics and chemistry, also give six lessons a week, and are in the laboratory from the morning until evening. There are 5 chemical assistants, 2 physical, 2 in anatomy, 2 in physiology, 2 in pathological anatomy, 1 in physiological chemistry, 4 in the medical clinic, 4 in the chirurgical clinic, and 3 *assistants d'accoucheur*.

The distribution of expenses is as follows for the years 1883–1884. Total expenditure, $231,300.

The management of the university (cleaning, clerical force, outlays) costs $9,724; the salaries of the regular and extraordinary professors, private instructors, lecturers, $133,250, of which the professors in the theological faculty receive $9,975; those in the law, $27,850; those in the medical, $32,525; those in the faculty of philosophy, $33,000; those in the scientific, $26,800. The various institutes and seminaries for maintenance demand $69,616, which is divided as follows: Anatomy, $4,312; physiological chemistry, $1,975; physiology, $2,050; pathology, $2,825; medical clinic, $3,612; chirurgical clinic, $4,725; clinic d'accouchements, $13,545; ophthalmic clinic, $1,300; clinic of psychiatry, $2,550; physical institute, $3,006; chemical, $6,675; zoological, $1,350; mineralogical, $1,500; botanical, $3,500; observatory, $3,512; philology, $1,125; archæology, $525, etc.

To these expenses a few others must be added, raising the total to $231,300. The receipts do not cover these outlays, and the German Empire subscribes an annual revenue of $100,000 for their payment.—*Revue Scientifique.*

"STORING WIND POWER," REVISED AND CORRECTED.

Here we are! Now we know how to do it; we thought we did not, but it seems it was only our own personal lack of knowledge, for forthwith the instruction comes, from the East and from the West. Under date of July 24, Mr. Davis writes from Calais, Me. (just as far east as you can get and call it United States), and one week later Mr. Mortensen gives his views in the *Racine Daily Journal.* It is quite pleasant to see that our utterances have stirred up the brethren, and though we may have occasion to show in what respects they are wrong in the conclusions which they reach, still it is only in the hope of stimulating them and many others to additional efforts. The problem is one involving interests of immense importance, and our first article was written in the hope of calling attention not only to its importance, but to the difficulty of its solution.

The plan suggested by Mr. Davis is to use the windwheels directly in raising weights, their descent by gravitation to drive the machinery. In many respects the suggestion is admirable. The direct application of the force to the driving shaft, and the hoisting and the transfer of this directly to the running gear, whatever it may be, is a matter well worth consideration. We have lost nothing of the power we originally derived from the wind except that which is due to friction. If this plan were practicable we should have made a great advance, but it brings to us the same difficulty that we encountered with the receivers of compressed air—it demands such dimensions as to make it too unwieldy for service.

A few figures will show this too plainly to be mistaken. We may assume that practically fifty feet would be as high as it would be best to calculate on hoisting the weights. Now if Mr. Davis will take his slate and pencil and check us when we go wrong, we will cipher it out. A weight of 100,000 pounds descending 50 feet may be held to develop one horse power nominally during one hundred and fifty minutes—two hours and a half—or a weight of 400,000 lb. to equal one horse power during a working day of ten hours. To insure consecutive work of a factory from wind power we need to retain a constant surplus for three days, though we should very seldom need it, as two days would carry us safely except at extremely long intervals.

Recurring now to the size formerly suggested, an engine of twenty horse power, we must have on the basis here shown, in order to secure thirty hours of service, 24,000,000 pounds in weight suspended at the height of fifty feet. Our material would naturally be cast iron, as the least expensive thing, without incurring a great additional bulk in using sand or water. (We shall find the bulk of the iron serious enough). To give us the weight we require we must have at least 53,000 cubic feet. A block four feet square by two feet thick, weighing over seven tons, would be as much as we could readily hoist at one lift. But of blocks of that size we must have over 1,600.

Placing them on the ground on their thin side, so as to occupy the least space and leave room for supports and for management, we cannot get them into less room than 300 feet by 150. That is something of a building, and all to run a twenty horse power engine. Perhaps some one will cipher a little further and estimate what sort of framework will be required to suspend 24,000,000 pounds fifty feet high and keep it running up and down all the time without shaking. We do not feel competent to the task; our arithmetic has given out, otherwise we should have gone into the market to try and see what we could buy that iron for. Really, we believe we should have taken to speculating in twenty horse engines before we could have completed the trade.

The plan suggested by Mr. Mortensen is to store the power by means of springs, which shall be forced down by the action of the windwheels, and drive the machinery by their recoil. This is not capable of being shown in figures as could the descent of weights, for we have no data from which to calculate. Mr. Mortensen thinks he can make a spring which shall be able to do the work of one horse power for an hour consecutively. If he can accomplish it he will make a wonderful advance, but it will be wise for him to be cautious in its management. When he has that amount of energy stored in it, he will have a fearfully dangerous instrument to manage. If he can restrain that terrible power and keep it in check so as to draw on it steadily and safely, very well; but it is perhaps probable that we shall wait a long time before we see it done. Of the supposed cost we are not told.

But let us hope for success, and try again. These two plans have not brought us what we need, but some others may. The matter is of too thoroughly vital importance to be dismissed simply because difficulties are in the way. Store the Wind Power.

DISTILLED water in the daylight is of a blue color. By gaslight the color is green.

What the Soil Needs.

Analyses of the constituents of growing and ripened plants are a safe means of ascertaining what constituents they take from the soil, and their proportional and absolute amounts. With these data the intelligent farmer can estimate, with an approximation to certainty, what in the way of special fertilizers he should return to the soil. The occasional—periodical—bulletins from State experimental stations are of value as guides to the cultivator of the soil in this direction.

From the August bulletin from the New York Agricultural Experiment Station at Geneva, N. Y., the following is copied as an analysis of the ashes of a yellow flint corn, the "Waushakum:"

Potash	34·36
Soda	0·50
Magnesia	11·64
Lime	10·76
Oxide of iron	1·28
Phosphoric acid	10·43
Sulphuric acid	2·60
Silica	19·59
Chlorine	2·93
Carbonic acid	5·76
	90 85

The demand for nitrogenous materials by the maize plant is shown in the statement, from analysis, that the corn in the dry state demanded and absorbed in one instance 1·86 per cent of all its nourishment, as shown by the residuum of ashes, the highest percentage of any of the constituents resolvable into ashes, the water, of course, passing off as vapor. The result of this series of experiments, extending over the period when the pollen of the corn impregnated the ear until the full growth of the grain, shows the necessity of frequent re-enforcements of the nitrogenous elements of the soil for the successful growth and ripening of the corn crop.

The Secret of the Success of Patent Medicine Manufacturers.

Says the *Milwaukee Sentinel,* in a recent article on "Patent Medicines": "It is advertising that is the secret of success in the case of patent medicines, if there is any secret about it. There is not a patent medicine which is superior to the preparations provided for by the standard medical publications. It is much simpler, however, for the person who wants a medicine to buy a bottle of patent medicine, good for every human ill, than to go to a physician. By advertising a patent medicine extensively and persistently the people are brought to recognize certain common and simple sensations as evidences of a disease which this particular remedy will cure. About all that is required to succeed in the patent medicine line is money and nerve to use it in advertising. It makes no sort of difference what medicine it it—the combination of drugs is the item of least importance.

It is well, perhaps, to put the drugs, if any are used, in spirits, so that a man can take his whisky with a clear conscience—indeed, with a sense of his own worthiness in taking care of his health. Occasional changes in the name of the medicine and of the maker are desirable, for after a few years the public demand something new. The same medicine may be used, but a change of name and of the character of the illustrations is demanded. After a long run of a patent medicine as a cure for lung troubles, a new run may be established by calling it a remedy for stomach troubles. When a fortune has been made out of lung pads, they can be cut down in size and another fortune made out of them as kidney pads."

An Artificial Nurse for Infants.

An apparatus for affording artificial heat to infants in the earlier stages of their existence after birth has been introduced into the Maternity Hospital, Paris, by Dr. Tarnier. He calls it a *couvreuse,* and it is a plain wooden case or box, measuring about 2 feet 8 inches by 2 feet 4 inches, and 2 feet 4 inches in height. The box has a double covering, the space between being filled with sawdust to retain the heat, and is divided into two parts. The lower half contains a reservoir, which holds about sixty liters of water, and is fed by a patent boiler that stands outside the box, and is warmed by an oil lamp; or hot water may be used without recourse to the lamp. The upper portion of the box forms a warm chamber, where a little basket or cradle is placed, large enough to hold two infants. From an opening at the side this cradle may be withdrawn, while the top of the box has a double glass covering, so that the children and the thermometer lying by their side can be constantly watched. Apertures are made in the lower portion of the box, the fresh air travels over the hot water reservoir, and is thus warmed before it reaches the child. The temperature within the *couvreuse* is generally maintained at 86° Fah., and though the contrast on withdrawing the child to be fed or washed is very great, amounting often to 30° Fah., colds are not so frequent as among the infants nursed in the ordinary manner. Altogether the experiment is considered so successful that it is proposed to supply all the hospitals of France with this automatic nurse.

Copper from Arizona.

Last year Arizona produced over 17,000,000 pounds of copper. Thus far during the present year the increase has been 38 per cent, and new furnaces are going up. Arizona's output will probably be not less than 25,000,000 pounds for 1883.

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Correspondence.

Discoloration of Brick Walls.

To the Editor of the Scientific American:

In your issue of July 21, a correspondent states that the white substance on houses is not sulphate of magnesium, but carbonates of sodium and potassium. While not doubting that such was the case with the substance he obtained, I can state positively that the substance on some of the Philadelphia houses last winter was sulphate of magnesium, I being a student in the University of Pennsylvania at the time, and making analysis of it. The theory of its formation is so evident that I will not encroach on you with the explanation.

L. G. EAKINS.

Silver Cliff, August 20, 1883.

G. F., of Va., sends specimens of apple leaves that are injured by insects, and asks what they are.

Ans.—The brown blotches on the upper surface of the apple leaves are the mines of the larva of the little tineid moth *Tischeria malifoliella*, Clemens. The eggs are laid in the spring on the surface of the leaf, and the larva on hatching bores in between two surfaces, and, as it increases in size, forms a mine. It changes to pupa within its mine, the walls of which are lined with silk. If this insect becomes so abundant as to threaten injury to the tree, the fallen leaves should be raked up carefully and burned in the late fall, as it hibernates in its mine.

The Locomotive Whistle Heard at a Distance of Fifteen Miles.

To the Editor of the Scientific American:

The SCIENTIFIC AMERICAN of August 18 states that the whistle of a locomotive is heard 3,300 yards, and the noise of the train 2,800 yards.

The railway station is distant from this post 5½ measured miles, and on calm days, when no wind is blowing, I can hear the whistle of the locomotive and the rumble of the train arriving at the station quite distinctly. The elevation of this post is about 5,000 feet. Reliable men working in the mines in the mountains north of the post, and distant about 14 miles from the post (about 9 miles in a direct line), at an elevation of about 7,000 feet, tell me they can plainly hear the whistle of the locomotive and the noise of the train, and also the reports of the muskets at target practice at the post. Fort Cummings is situated at the foot of the mountains, and the country between the fort and the station is flat. This would make the whistle heard a distance of 15 miles, or about eight times that stated. The mountains may assist in transmitting the sounds *from* the post, but they certainly cannot those from the station *to* the post, as the intervening ground is comparatively level.

CHAS. S. HALL.

Fort Cummings, N. M., August 23, 1883.

Manufacture of Sorghum Sugar.

To the Editor of the Scientific American:

I have read with interest, and in the cause of truth and justice desire to controvert, certain statements made and conclusions drawn in an article contained in your issue of August 18, under the title "The Sugar Canes."

You describe the juice obtained from sorghum as "unstable in its chemical character; . . . that its sucrose has a strangely perverse tendency . . . to become . . . glucose." And you add: "Unless this tendency is arrested every grain of available sugar may have disappeared, and probably will, within twenty-four hours from the commencement of the change; that is, from the time of cutting the sorghum. The transformation can be prevented by the use of lime, but, practically, this is best done by boiling."

I also desire to call attention to one or two statements contained in the "Report of the Commissioner of Agriculture" for the years 1881 and 1882.

On page 20 of said report you will find that from nearly 100 acres of cane the average yield was less than 2½ tons per acre, from which "were obtained 2,977 gallons of sirup and 165 pounds of sugar," *only*.

I do not stop to note the fact that "the expenses of raising the cane were $6,589.45," nor that the expense of converting the cane raised into sirup and sugar "was $1,667.50." The total amount of "money covered into the Treasury" was $768.24.

After such returns as the foregoing it is not surprising that, on page 680 of the same valuable report, we find Commissioner Loring forced to admit that "the business of manufacturing sugar from sorghum at the department . . . failed in 1881, and . . . furnished discouragement rather than information to those engaged in it."

My interest in the sorghum industry dates from the spring of 1880. Small experimental works were then erected at Cold Spring, near Cape May City, under the supervision of Mr. Henry A. Hughes. Mr. Hughes crushed 292 tons of sorghum, which was raised by our farmers in this vicinity. By a process of defecation discovered and applied by Mr. Hughes this amount of cane was made to produce, in round numbers, 16,000 pounds of sugar. The mill was small, the works were imperfect, evaporation was in open pans, and only a small percentage of the sugar was obtained; but such was the encouragement which these results afforded that at the next session of our legislature an act was passed offering a bounty, to be paid by the State, of one dollar per ton for every ton of cane raised and one cent per pound for every pound of sugar produced. Thus encouraged, what is known as the "Rio Grande Sugar Company" was formed, large works were erected, cane in large quantities was obtained, and "expert sugar boilers" were procured from New Orleans and Cuba. These "experts" attempted to obtain sugar by means of the old lime process alone. Except from one small, inferior lot of juice, and by a "chance shot," as you would describe it, a small quantity of inferior sugar was obtained. In this instance the juice "chanced" to be nearly neutral, a circumstance which occurred at no other time during the season.

This failure caused the abandonment of the lime process; the method of defecation pursued by Mr. Hughes with such signal success the year before was resumed; the juice was found to crystallize readily, and from the day that Hughes' method was resumed it has been attended with unvarying success.

Last year the company produced from 6,206 tons of crushed cane 1 022 barrels of molasses and 319,944 pounds of sugar; the juice was tested four times each day, and showed a coefficient of purity as high as 92°, with the season's average of 84°.

Unless the character and quality of sorghum elsewhere in the United States are different from what they are in southern New Jersey, farmers, manufacturers, and experimentalists, Government or otherwise, will obtain no sugar unless at a "chance shot" by the use of common lime alone; it will not prevent the "transformation" to which you refer.

I submit that the manufacture of sugar from sorghum is an established success here in this part of New Jersey, and its success is altogether due to the abandonment of the "lime alone" process, and the adoption and utilization of the process discovered by Mr. Hughes, general manager of the Rio Grande Sugar Company.

Mr. Hughes' process is no longer a secret, inasmuch as he has recently been granted letters patent by the proper department at Washington.

At the present moment over a thousand acres of sorghum are rapidly ripening, and the work of cutting the cane and making sugar will be begun within twenty days, and will proceed until the crop has all been harvested.

The process of regularly, successfully, invariably producing sugar on a large scale may be seen by visiting the Rio Grande sugar works at any time during the coming fall.

The works are situated on the West Jersey Railroad, two hours' ride from Philadelphia.

There is no act of my public life that I regard with more satisfaction than I do the fact that, as Senator in the New Jersey Legislature, representing this county, I introduced at the session of 1881 the bill which became a law, and which confers the bounty to which I have referred. In accordance with the terms of this law the amount paid out of the State treasury last year was $8,837.44.

Yours respectfully,

W. B. MILLER.

Cape May, N. J., August 23, 1883.

A Steamer in the Niagara Whirlpool.*

In the year 1846 a small steamer was built in the eddy just above the railway suspension bridge to run up to the Falls. She was very appropriately named The Maid of the Mist. Her engine was rather weak, but she safely accomplished the trip. As, however, she took passengers aboard only from the Canada side, she did little more than pay expenses. In 1854 a larger, better boat, with a more powerful engine, the new Maid of the Mist, was put on the route, and many thousands of persons made this most exciting and impressive tour under the Falls. The admiration which the visitor felt as he passed quietly along under the American Fall was changed into awe when he began to feel the mighty pulse of the great deep just below the tower; then swung around into the white foam directly in front of the Horseshoe and saw the sky of waters falling toward him. And he seemed to be lifted on wings as he sailed swiftly down on the flying stream through a baptism of spray. To many persons there was a fascination about it that induced them to make the trip every time they had an opportunity to do so.

Owing to some change in her appointments, which confined her to the Canadian shore for the reception of passengers, she became unprofitable. Her owner, having decided to leave the place, wished to sell her as she lay at her dock. This he could not do, but had an offer of something more than half of her cost if he would deliver her at Niagara, opposite the Fort. This he decided to do, after consultation with Robinson, who had acted as her captain and pilot on her trips under the Falls. The boat required for her navigation an engineer, who also acted as a fireman, and a pilot. On her pleasure trips she had a clerk in addition to these. Mr. Robinson agreed to act as pilot for the fearful voyage, and the engineer, Mr. Jones, consented to go with him. A courageous machinist, Mr. McIntyre, volunteered to share the risk with them. They put her in complete trim, removing from deck and hold all superfluous articles. Notice was given of the time for starting, and a large number of people assembled to see the fearful plunge, no one expecting to see either boat or crew again, after they should leave the dock. This dock, as has been before stated, was just above the railway suspension bridge, at the place where she was built, and where she was laid up in the winter; that, too, being the only place where she could lie without danger of being crushed by the ice. Twenty rods below this eddy the water plunges sharply down into the head of the crooked, tumultuous rapid which we have before noticed as reaching from the bridge to the Whirlpool. At the Whirlpool the danger of being drawn under was most to be apprehended; in the Rapids, of being turned over or knocked to pieces. From the Whirlpool to Lewiston is one wild, turbulent rush and whirl of water without a square foot of smooth surface in the whole distance.

About three o'clock in the afternoon of June 15, 1861, the engineer took his place in the hold, and knowing that their flitting would be short at the longest, and might be only the preface to a swift destruction, set his steam valve at the proper gauge, and awaited—not without anxiety—the tinkling signal that should start them on their flying voyage. McIntyre joined Robinson at the wheel on the upper deck. Self-possessed, and with the calmness which results from undoubting courage and confidence, yet with the humility which recognizes all possibilities, with downcast eyes and firm hands, Robinson took his place at the wheel and pulled the starting bell. With a shriek from her whistle and a white puff from her escape pipe to take leave, as it were, of the multitude gathered on the shores and on the bridge, the boat ran up the eddy a short distance, then swung around to the right, cleared the smooth water, and shot like an arrow into the rapid under the bridge. She took the outside curve of the rapid, and when a third of the way down it a jet of water struck against her rudder, a column dashed up under her starboard side, heeled her over, carried away her smokestack, started her overhang on that side, threw Robinson flat on his back, and thrust McIntyre against her starboard wheelhouse with such force as to break it through. Every eye was fixed, every tongue was silent, and every looker-on breathed freer as she emerged from the fearful baptism, shook her wounded sides, slid into the Whirlpool, and for a moment rode again on an even keel. Robinson rose at once, seized the helm, set her to the right of the large pot in the pool, then turned her directly through the neck of it. Thence, after receiving another drenching from its combing waves, she dashed on without further accident to the quiet bosom of the river below Lewiston.

Thus was accomplished the most remarkable and perilous voyage ever made by men. To look at the boat and the navigation she was to undertake no one would have predicted for it any other than a fatal termination. The boat was seventy-two feet long, with seventeen feet breadth of beam and eight feet depth of hold, and carried an engine of a hundred horse power. In conversation with Robinson after the voyage, he stated that the greater part of it was like what he had always imagined must be the swift sailing of a large bird in a downward flight; that when the accident occurred the boat seemed to be struck from all directions at once; that she trembled like a fiddlestring and felt as if she would crumble away and drop into atoms; that both he and McIntyre were holding to the wheel with all their strength, but produced no more effect than if they had been two flies; that he had no fear of striking the rocks, for he knew that the strongest suction must be in the deepest channel, and that the boat must remain in that. Finding that McIntyre was somewhat bewildered by excitement or by his fall, as he rolled up by his side but did not rise, he quietly put his foot on his breast to keep him from rolling round the deck, and thus finished the voyage.

The effect of this trip upon Robinson was decidedly marked. To it, as he lived but a few years afterward, his death was commonly attributed. But this was incorrect, since the disease which terminated his life was contracted at New Orleans at a later day. "He was," said Mrs. Robinson to the writer, "twenty years older when he came home that day than when he went out." He sank into his chair like a person overcome with weariness. He decided to abandon the water, and advised his sons to venture no more about the Rapids. Both his manner and appearance were changed. Calm and deliberate before, he became thoughtful and serious afterward. He had been borne, as it were, in the arms of a power so mighty that its impress was stamped on his features and on his mind. Through a slightly opened door he had seen a vision which awed and subdued him. He became reverent in a moment. He grew venerable in an hour.

*From "Niagara: Its History and Geology." By Geo. W. Holley.

New Method of Mixing Hypo and Alum Bath for Gelatine Plates.

The Marquis de Ferronnay recommends a somewhat novel method of mixing the hypo and alum bath, his plan being as follows: One liter of warm water is poured on a mixture of 150 grammes of hyposulphite of soda and 40 grammes of alum, the whole being well stirred; a piece of wood being more convenient for this purpose than a glass rod. A small proportion of sulphur is deposited, but after this has been removed by filtration the solution is ready for use, and it is said that such a bath may be used more than a hundred times without becoming colored.

As the fixing bath containing alum is more or less liable to deposit sulphur, it is advisable to filter it immediately before use, and in order to guard against the possibility of a deposit of finely divided sulphur remaining on the surface of the negative, it is well to pass the hand lightly over the film while the plate is in the wash water. The alum and hypo bath does not appear to cause the sulphuration of the image, and we see no reason to suppose that negatives fixed in the composite bath are likely to be less permanent than those which have been fixed in the simple hypo bath.—*Photo. News.*

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A New Electric Light.

Among the novelties having a probable influence in the future upon photography, says a correspondent of the *British Journal of Photography*, is a new invention by Mr. Frederick Varley, of the Mildmay Park Telegraph Works, London.

In the incandescent electric lamps a fine flexible filament of carbon, inclosed in a vacuum tube, is made white hot by the electrical current. Mr. Varley also uses flexible filaments, but in a thick, rope-like bundle, and he burns them in an arc lamp. The result is curious and novel. Instead of the dazzling point of light, emitting rays from a very small area, and looking like a brilliant star, the Varley light is more like a planet, presenting a disk of appreciable diameter. Another feature is that the space between the two filamentary carbons is so heavily charged with ignited carbonaceous matter that the total electrical resistance of the circuit is considerably reduced, so that many more lamps than those containing hard carbons can be put in the circuit, and worked without any increase in the amount of electrical power. Another novel feature is that most of the luminosity comes from the arc itself and not from the ends of the carbons; whereas in the present arc lights the luminosity comes chiefly from the ignited ends of the hard carbons, and not from the intermediate arc. The carbons do not burn into large cups and cones, but burn away flat at the ends; nevertheless Mr. Varley thinks that the usual cups and cones are there, at the ends of the fine filaments. He has not, however, been able to see them under a microscope. The filamentary carbons are flexible; those as thick as a cord can be twisted round the finger. The inventor can wind his carbons on a wheel, and pay them out by clockwork or otherwise to feed the light. The light is a noiseless one, the hissing due to the tearing away of particles from the ends of the hard carbons being absent. When the power is too weak a slight noise is made now and then, like the "cry" of a diamond when cutting glass.

The diameter of the Varley carbons has to be regulated according to the strength of the current, otherwise they burn away somewhat rapidly; but Mr. Varley informs me that when the carbons are properly proportioned in dimensions to the current they burn away more slowly than hard carbons. The luminous arc between the filamentary carbons is remarkably sensitive to the action of a magnet, being easily deflected thereby. The chief objection, so far as I know, to the new electric light is that the arc being a good conductor the carbons require a greater range of "play" in the matter of distance from each other than is the case with the present arc lights; hence a special lamp has to be devised to burn the carbons to the best advantage, and there are, consequently, difficulties to be overcome. As these difficulties, however, are merely mechanical they are not likely to exist long without being surmounted.

To make the carbons, Mr. Varley takes pieces of rope or of plaited sord, soaks them in paraffine or crude ozokerite—an inexpensive fossil wax—and carbonizes them in a crucible filled with hydrocarbon vapor. The firing is continued for ten or twelve hours, and the heat is intense enough to soften wrought iron to a plastic state—slightly below its melting point. Thin pieces of wrought iron laid between pieces of rope in the melting pot have in some cases been so softened as to receive impressions from the carbonized fibers, as if the iron had been soft wax.

Harmony and Beer.

Beer and song seem to go well together, if we are to judge by the sale of the beverage during the recent saengerfest at Buffalo. This musical festival lasted one week, during which the consumption of lager exceeded that for the corresponding week of last year by 2,130 barrels. This is equivalent to an excess of 66,030 gallons or 1,056,480 glasses over the ordinary consumption. The expenditure for beer was $52,824 more than usual. Besides this, an immense quantity of wine, alcoholic liquors, and mineral waters was disposed of. It is estimated that Buffalo profited by the festival to the extent of $300,000.

If the proposed tunnel should be made for the relief of about 180 mines in Gilpin County, Colorado, it would be one of the largest of the kind in the world. These mines produce about two million dollars a year, chiefly gold, of which the total output since its discovery in 1859 has been over thirty-seven millions, besides three and a half millions in silver.

THE FIRST ELECTRIC MOTOR.

Works that treat of the history of electric motors generally indicate as one of the oldest of such apparatus that of the Abbé Salvatore dal Negro, Professor of Natural Philosophy at the University of Padua, and which, constructed along toward the year 1832, was described at about this epoch in

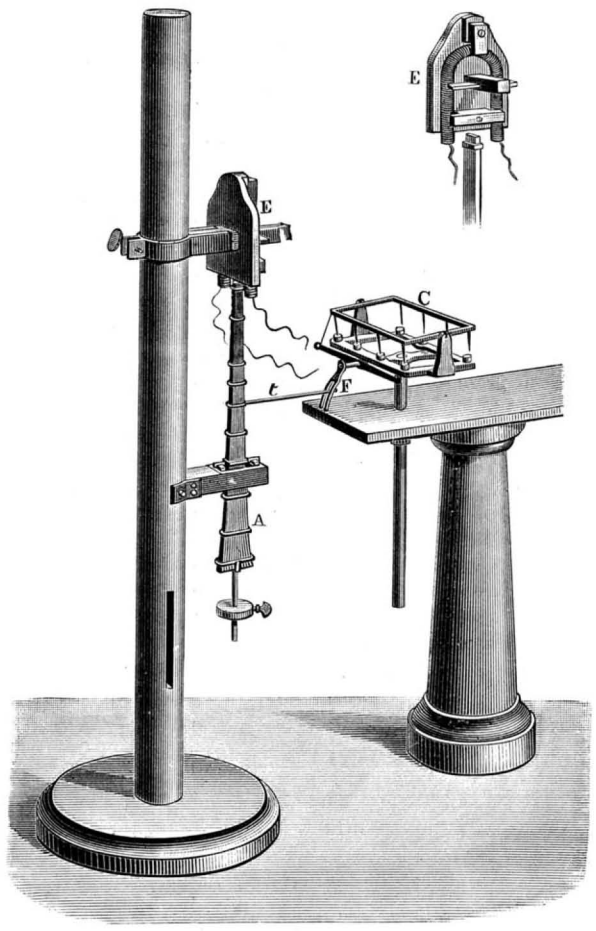

Fig. 1.—DAL NEGRO'S ELECTRIC MOTOR. (1830.)

the *Bulletin* of the Académie des Sciences, Lettres, et Arts of Padua, vol. iv., and later, in April, 1834, in the Lombardo-Venetian *Annales du Royaume*.

These indications as to date are about all that we find relative to Dal Negro's apparatus. The Italian section of the exhibition of 1881, so rich in electric apparatus, furnished upon this point, however, an interesting document in the way of two types of the motor under consideration. The data affixed to the apparatus with great care by the Italian Commission carry the date at which the first of these types was constructed back to 1830. The motor must, then, have anticipated those ideas that, according to the *Electrician* of September 9, 1882, Dr. Schulthess expressed in 1832 in regard to the construction of apparatus of this kind, and must have been the first that was ever constructed; and it is curious at the present time, when such an application of electricity has made so important an advance, to see what the idea was that constituted the germ, so to speak, of modern progress.

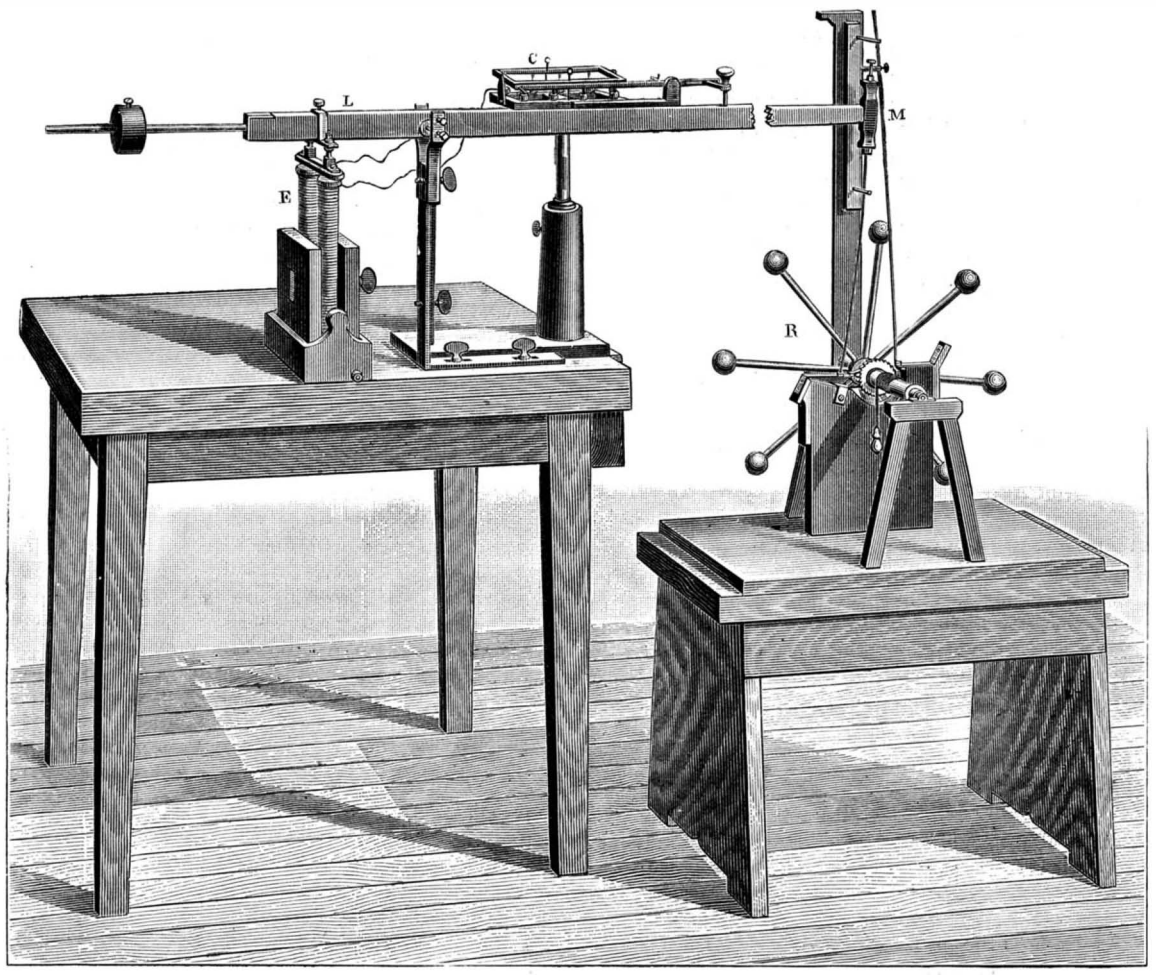

Fig. 2.—DAL NEGRO'S ELECTRIC MOTOR. (1831.)

The first type of the Dal Negro motor, which, at the Palace of Industry, bore the date of 1830, consisted (Fig. 1) of a magnet, A, movable around an axis situated at about one-third of its length, and the upper extremity of which was capable of oscillating between the two branches of an electro-magnet, E, represented separately in the figure. A current, being sent into the electro-magnet, passed through an 8-cupped mercurial commutator, C, that the oscillating magnet controlled by means of a rod, *t*, and a fork, F. As a result of such an arrangement, when the magnet had been attracted toward one of the poles of the electro, this very motion of attraction, acting upon the commutator, changed the direction of the current, and the magnet was repelled toward the other branch of the electro, and so on. It was a simple alternating motion.

The apparatus, however, contained one interesting detail: The movable magnet, when it touched the poles of the electro, abutted, not against the iron itself, but against the insulated wire that covered it. Either accidentally or designedly the author thus avoided those inconveniences connected with remanent magnetism which later on were to embarrass other inventors when polarized armatures were applied to electric telegraphs. The other apparatus, which the ticket affixed by the Commission stated was constructed in 1831, was designated on this same ticket by the name of "Prof. Salvatore dal Negro's Simple Electro-magnetic Ram."

In this second arrangement, Fig. 2, we find the same play of the commutator as in the former, but it is this time controlled by a horizontal lever, L, which, instead of itself constituting the armature, supports the latter above the electro-magnet, E. The lever, L, terminates in a sort of hammer, M, which is prolonged beneath by a stiff rod that controls a click. This latter acts upon a ratchet wheel, and thus sets in motion a sort of wheel, R, composed of rods terminating in balls.

In this case, the motor, instead of simply keeping up its motion, produced a small amount of work; but what a feeble performance, and how much had we ought to congratulate ourselves at the progress accomplished, when we reflect that at this same exhibition, at which the Pacinotti ring reigned as master, and at which the Dal Negro motor figured as a simple curiosity, inventors were still exhibiting, as practical, motors that were based like this latter upon the transformation of alternating motion.—*La Lumiere Electrique.*

Anti-Cholera Rules.

Pasteur has published nine anti cholera rules, of which the following is an abridgment:

All table water must be boiled, and bottles half filled with it. Before being drunk, the water should, to aerate it, be well shaken. The pitchers or other vessels in which water is generally stored in kitchens ought, before they are each day replenished, to be heated to 150° Centigrade, or a higher temperature if possible. Wine should be also heated to 55°, and drunk out of cups which have been freshly plunged in scalding water. All food should be thoroughly cooked. Underdone flesh and raw vegetables promote cholera. The other vessels in which jam is to be kept are to be prepared for its reception by a passage through a furiously hot oven. Bread is to be cut about twenty minutes before it is wanted, and toasted hard, or rebaked quickly. All sheeting and cloths ought to be scalded and rapidly dried before being used. Water for toilet purposes is only safe when it has been first boiled, and then diluted with thymic acid dissolved in alcohol, or carbolic acid, in the proportion of two grammes per liter. Hands and face should be frequently washed with this mixture. Plates, knives, forks, etc., are to be taken straight from the boiler or oven to the dinner table. The ninth rule is the least practicable. Pasteur has drawn it up for the especial benefit of doctors, nurses, and persons who reside in houses or neighborhoods visited by the epidemic. It prescribes the wearing of a mask made of two thin sheets of brass, fitting well into each other, but not soldered together. A layer of phenolized wadding is to be placed between the metal strata. The operation of breathing is to be performed through mouth and nostrils covered with wadding.

THE idea that lightning is not so destructive as it used to be in the United States, because the network of railroads and telegraph wires lessens the number of accidents, is met by the record of the summer. Fatal thunderbolts have never been more common.

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The Progress of New York.

In 1771 the population of the city of New York was a little over 21,000; and in 1786, three years after the close of the revolutionary war, it had 23,614 inhabitants. The several censuses taken during the past 100 years exhibit the marvelously rapid strides which New York has made toward her present imperial position. In 1790, however, the population was little more than it was in 1771; but by 1800 it had risen to 60,515. The remaining censuses are thus given; 1810, 96,373; 1814, 95,518; 1820, 123,706; 1825, 166,086; 1830, 202,589; 1835, 270,089; 1840, 312,710; 1845, 371,223; 1850, 515,547; 1855, 629,906; 1860, 813,669; 1865, 726,384; 1870, 942,292; 1875, 1,041,886; and 1880, 1,206,299. On only two occasions has the enumeration shown a decrease from the figures of the preceding census. The first time was after the war of 1812, and the second after the civil war. The population of New York city has doubled six times within a century—doubling, on an average, once in every 17 years. In other words, the New York of to-day, is 64 times as large as the New York of 100 years ago. The rate of increase in the country at large is insignificant beside that of the metropolis. In 100 years the population of the United States has multiplied itself by 16; but the population of New York has increased at four times that rate. At the rate of increase shown by the last 25 years alone—a rate diminished by the decline of American commerce and the influence of the civil war—there are children now nursing who will behold a New York city containing no less than 10,000,000 inhabitants.

The California Redwoods.

A correspondent of the *Federal Australian* from San Francisco describes the cutting down of some of the great trees on the Pacific shore. He says:

"It is a magnificent yet a painful sight to witness the operations in one of these redwood forests. You stand in the midst of vast trees, so close together that there is a dim religious light around you like that of a cathedral. This delusion is furthered by the apparent regularity with which many of these trees grow. You can look down a long aisle as if it were a groined arch of cathedral roof, and the only thing which undeceives you is, on looking up, far above your head, to see rifts of blue sky between the branches. But you are suddenly startled by a long cry of warning, which follows the rhythmic chopping sound of the axe and the swish of the saw. It is the woodman, and his melancholy cry portends the fall of a mighty tree. There is a long and labored groaning sound; it is the tree breaking away from the friendly base which has held it, perhaps, for ages. Then there is a sharp "crack." The tree has snapped in twain. The mighty mass trembles slightly for a moment, then inclines in the direction toward which the practiced woodmen have designed it to fall. It topples—it falls. There is an awful crash—the falling tree is smiting the branches from a fellow tree which still stands upright, but not for long. There is a sound like a peal of thunder—the tree has struck the ground. The earth trembles for rods around, as if there were an earthquake; there is a cloud of dust, and all is over.

"The redwood is a most valuable kind of timber. It is very slow to burn, and if ignited is easily extinguished. It is very heavy and very dense in fiber, yet very easy to work, splitting with the most perfect accuracy, and yielding to the saw, the chisel, etc., with the utmost ease. When polished it makes a most handsome wood for interior fittings, and many of the finest houses in California are fitted with this wood in its polished state."

The Woodchuck.

A special committee of the New Hampshire Legislature has been amusing the members of the legislature and the readers of its reports by a semi-serious diatribe against the woodchuck; the occasion being a bill to authorize a bounty of fifteen cents on each woodchuck killed.

But really the "woodchuck," or "wood hog," is a terrible pest to farmers in New England and in the northern tiers of counties of our Middle States. It does immense havoc to growing crops, and its devastations seem to require as encouraging legislative enactments for its destruction in the way of bounties as in former years the legislatures offered for wolves' heads or foxes' skins.

The woodchuck is one of the most wary of animals. He is as bad a sneak as the weasel. He makes his ground burrow in a field planted to corn, or to other vegetables, or cultivated to clover. His hole may be found, but long before the beast can be reached he is far away. It is difficult to attempt to drown out a woodchuck by filling his hole with water. Long before the water can be brought the sly woodchuck has made a new home. Indeed, it is a fact that a chased woodchuck has made a new burrow almost in sight of his pursuers while they were searching for him.

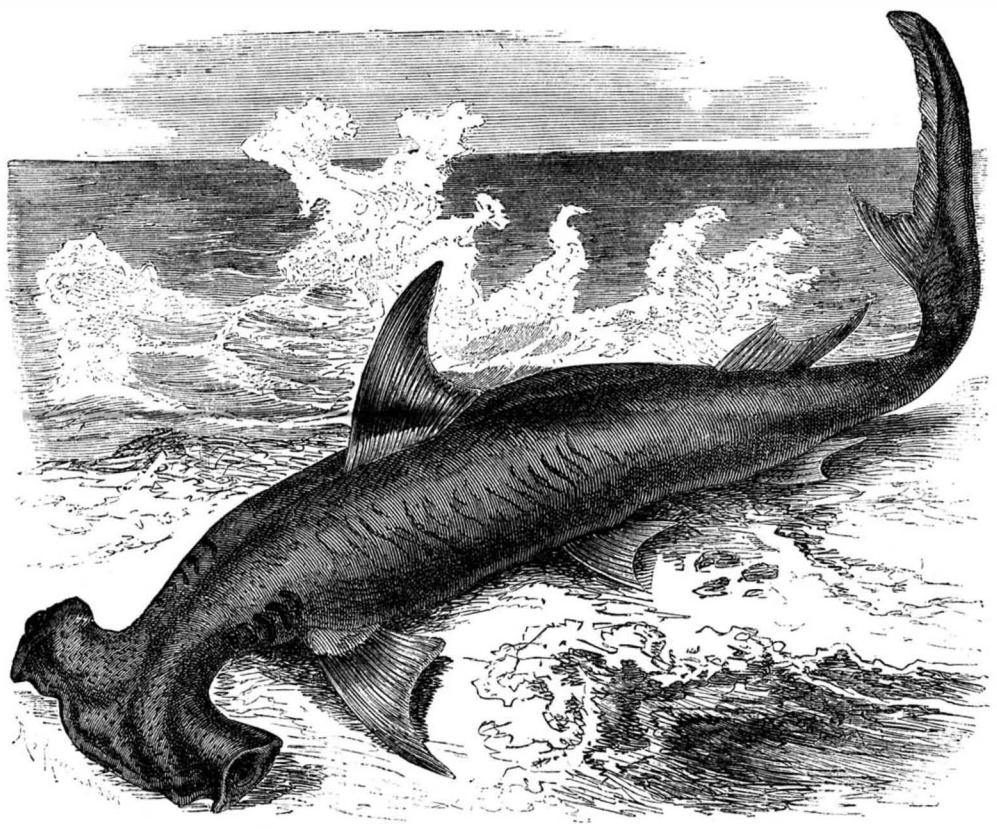
There is nothing succulent and of a salad quality that the woodchuck does not relish; growing beans, lettuce, peas, springing corn, new potatoes, anything that is good for humans is good enough for him. He will make a meal off of clover, or will subsist on ordinary grass.

But all his life he knows that he is a sneak thief. He does not come out and rob like his betters of the *ferox* tribe, but is very careful about exposing himself. Just after the sun has sunk in the west, in the intergloaming between daylight and dark, he sneaks out of his hole and goes to feeding, but he never feeds without watching. His down nibblings and uprisings are so frequent as almost to be instantaneous. It is considered in New England localities where the woodchuck abounds a fair trial of skill to send a rifle bullet through one as he shows himself above the grass or stubble. This extraordinary quickness of movement makes the hunting of the woodchuck a sport. Usually the woodchuck is caught with dogs and "drowning out" by pouring water in his subterranean habitation, after driving him in and being sure that he is there.

The woodchuck, to those whose prejudices do not extend beyond reason, makes a palatable dish. He is a cleanly fed animal, taking only vegetable food. He is a hibernating animal, sleeping like the bear from frost to spring, and grows fat on the growing vegetation of the field and garden, until in the fall he is "fat as a hog," which he is, and deserves to die to give food to those whom he has robbed a whole season through.

HAMMER-HEADED SHARK.

The hammer-headed shark (Zygæna malleus) is a very remarkable fish, and has from ancient times excited general attention. It resembles others of the shark family in the number and position of its fins, but is distinguished from them and all other vertebrate animals by the lateral expansion of the head, especially of the bones and cartilage around the eyes, so that the head resembles a hammer, the eyes being placed at the projecting extremities.



HAMMER-HEADED SHARK.

This fish is found in the Mediterranean Sea, and sometimes strays as far as the northern coast of Europe. It is about seven or eight feet long, but specimens have been found eleven and twelve feet in length. Its body is covered with a granulated skin, the upper side being of a grayish brown, and the under side a grayish white; the large eyes are golden yellow. The teeth are long, sharp, almost triangular, and serrated on the edges.

They search for prey around ships. Gessner says: "They are large, hideous, terrible animals, and destroy men who are swimming, and it is considered a sign of ill luck to see them."

They produce living young. In a hammer-headed shark captured on the English coast were found thirty-nine fully developed young, averaging nineteen inches in length.

Oil is procured from the liver, but the flesh is not good, being hard and ill-flavored.—*From Brehm's Animal Life.*

The Indications of the Clouds.

Some of the oldest text books, or the reading books, of the present mature generation show by text and illustration the shape and the proportional construction of clouds, giving them names; as, the *cirrus*, *stratus*, *cumulus*, *nimbus*, and their names compounded. A recent contributor to our cloud knowledge is an English meteorologist, Rev. W. C. Ley, who has initiated the appearance of the clouds as a study by means of photography. He claims that by observing cloud forms he can predicate rain from the surface of a cloud whose *nimbus* portion may be forty miles away. His plan comprehends the material as well as the forms of clouds. The *cirrus* is an ice cloud sailing at an altitude of from three and a half to seven or eight miles above the general surface of the earth, with a very high velocity, at times exceeding that of the locomotive. The icy structure of the upper clouds is evidenced, not only by the fact that at the levels on which they move the temperature must be extremely low, but by the fact that halos and mock suns, formed by *cirri*, cannot be explained in accordance with optical laws, except on the hypothesis that the light is refracted through minute prisms of ice. "Outlying streaks of this cloud, often from 20 to 100 miles in advance of the main pack," he shows, serve as "the pioneers of the coming army"—these attenuated threads of ice crystal, between 25,000 and 40,000 feet above the earth, arranged in parallel lines, gradually overspreading the sky with a milky looking film of whitish cloud matter. This stage occurs at a place lying in the storm's track before the barometer gives any warning, and sometimes while the mercury in the weather glass is rising. Thus the trained observer may consider these clouds as storm signals, advertising, by their peculiar movements, not only the coming of the storm, but also the bearings of its center.

Uses of Slag.

Among the utilizations of furnace slag, those by Mr. Charles Wood, of Middlesbrough-on-Tees, promise to be of considerable commercial value. From the slag he has formed building bricks by reducing the slag to a sand and mixing it with lime, the mixture being pressed, dried, and air hardened, without baking. It is claimed that bricks thus made were not only so tough as to resist splitting when a nail was driven into their substance, but that they had a crushing resistance fully equal to the ordinary bricks.

A finer sand was used also to form a cement, the composition being two and a half parts each, by measure, of slag sand and ground brick to one part Portland cement. The slag sand was obtained by running the molten slag into water kept in agitation.

Paving blocks and tile, and even railway sleepers, have been made direct from the molten slag, but it is doubtful if the economy of this method of utilization would permit the transportation of these weighty materials, substitutes for which could generally be found on or near the place of using.

Glass of the coarser sorts has been produced from molten slag mixed with sand and alkalies in the proportion generally of one-half slag. The heat of the fused slag was an advantage in its use over the use of other materials, although a remelting was necessary after the addition of the other materials. The production of "mineral wool" for non-conducting and similar purposes is only another treatment of the slag as a vitreous substance, it being torn into filaments by the force of steam. Even this use of slag is so slight in amount that it seems to have no appreciable effect on the growing masses of residuum from blast furnaces in our iron producing localities.

Two years ago Mr. A. D. Elbers, of Hoboken, N. J., patented a process for rapidly cooling the flowing slag in successive layers, or rather in a welded mass, so as to form coherent blocks or slabs of any required form and dimensions. But none of these attempts can keep pace with the continuous waste of slag material at the ore reducing furnaces, even when these furnaces are the centers of increasing populations and parts of busy cities.

New Statue of Washington.

This statue, of bronze, to be thirteen feet high and to weigh more than one and a half tons, is expected to be ready to be unveiled November 26, on a pedestal at the center of the flight of steps on Wall Street, New York, leading to the doors of the Sub-Treasury building. The statue is by J. Q. A. Ward, and is to be of bronze cast in Philadelphia, and will cost at least $35,000, which has been raised by a committee of the New York Chamber of Commerce. The statue is intended to represent Washington just after he has taken the oath of office as the first President, as he stood on the 30th day of April, in the year 1789, on the balcony of the old Federal Building, which occupied the site of the present Sub-Treasury building. He stands in an easy, natural, yet very dignified pose, looking out to the right, with his right arm extended, and his left hand placed on the hilt of his sword. The moment chosen is that when, after taking the oath, he said, "I will, so help me God!" The expression of his face, modeled from the Houdon bust and the Stuart portrait, is calm, earnest, and resolute. Its completion and erection will add another to the attractions of the metropolis, and to the mementos of the early history of the country as a Union of States.

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The Invention of the Telephone

We have heretofore noticed the decisions of the Patent Office, by which the prior claims of James W. McDonough, of Chicago, as the inventor of the principal telephone instruments have, after several years of delay, been recognized by the allowance of patents to him. His inventions, together with various others by other parties, relating to the working of telephones, exchanges, etc., have been acquired by the United States Telephone Manufacturing Company, of New York. This corporation issued a statement of its rights and position in respect to the telephone, in which it asserts that the American Bell Telephone Company, with its aggregate capital valuation of one hundred millions of dollars, has really no right or title to any of the numberless instruments which it now has in use; but every one of them are infringements upon the United States Company's patents, and sooner or later will be so declared by the courts. According to the statement the only basis which the gigantic Bell Corporation now flourishes is the wit and ability of its lawyers in devising technical objections and obstructions that postpone the trial of the telephone issues before the courts.

It is claimed by the United States Corporation that McDonough was the original and first inventor of the art of transmitting speech by electricity, just as it has heretofore been claimed, and in fact decided by the courts, that Bell was the original Jacobs. The Patent Office, the United States Court, Bell, and McDonough, all appear to be unanimous that Phillip Reis, who made the first instrument for conveying speech and sounds by electricity, who in fact invented the word telephone and christened the instrument with that euphonious name—all, appear to be unanimous that Reis must be ignored and his marvelous discovery buried in oblivion. The United States Company says in its statement:

"On the 10th day of November, 1879, a contract was entered into between the Bell Telephone Company and the Western Union Telegraph Company and others, which has very seriously restricted the public use of the telephone, preventing the telephone company from extending to its patrons the advantages of the telephone, for communicating between cities, greatly to the disadvantage of individual and business interests, and only serving to materially aid in building up the monopoly of the Western Union Telegraph Company. As the United States Telephone Manufacturing Company has not entered into any such complicated alliances, the use of the telephone between cities and towns for all purposes now opens up an additional and very extensive field; one which threatens eventually to supersede the telegraph itself for prompt and cheap communication between distant points.

"This company owns the only long line telephone systems especially adapted for this purpose, and which have been tested and proved to be eminently practicable.

"The Records of the Patent Office show that Mr. James W. McDonough, of Chicago, Ill., before the 31st day of December, 1867, invented and constructed a telephone receiver, consisting of a combination in an electric circuit of an electro magnet and a diaphragm, supported and arranged in close proximity thereto, whereby sounds thrown upon the line were reproduced accurately as to pitch and quality.

"On the 26th day of August, 1871, Mr. McDonough made a drawing of a telephonic transmitter and receiver, also of the circuit with battery included, showing how to use them, 'for the transmission of speech through wires by means of electricity,' substantially as used by him experimentally in the year 1867, as above stated.

"Early in May, 1875, Mr. McDonough constructed and practically operated a telephone by means of the human voice, and an electric current through wires connecting a diaphragm contact electrode transmitter with a diaphragm receiver, with an electro magnet in close proximity thereto.

"During the summer and fall of 1875, Mr. McDonough made a number of modifications of his apparatus, and on the 10th day of April, 1876, filed his application in the United States Patent Office, boldly claiming the reproduction of articulate speech by means of electricity. Moreover, he devised a title to typify his invention, calling it a teleloge—which signifies 'far speaker.' In reality a more significant and appropriate title than 'telephone,' the latter signifying far sounder.

"*No one* before that time had made the claim of having even constructed an apparatus which could be made to reproduce speech by means of electricity, and James W. McDonough stands as the *first person* before the world and the Patent Office as the enunciator of the fact that he had discovered the art of transmitting articulate speech by electricity, *and made a successful working apparatus.*

"In the same year (1876) Mr. Bell filed an application for a method of transmitting two or more telegraphic signals simultaneously over a single wire, to enable several telegraphic dispatches to be transmitted at the same time, but no disclosure was made that would lead any person, even the most skilled in electrical matters, to know that the invention described was for a speaking telephone, much less to enable persons so skilled to have made a speaking telephone from the drawings and descriptions given. *In fact, in a critical suit recently concluded in England, the high court of that country decided positively that this* (1876) *patent of Bell's did not disclose the invention of a speaking telephone.*

"The first application filed by Mr. Bell for the transmission of articulate speech, or for any instrument capable of such transmission, *was on January* 15, 1877, *more than nine months after McDonough had filed his application, accompanied by working models capable of illustrating his claim.*

"Mr. Bell's patent was issued to him on January 30, 1877, *fifteen days only* after his application was filed, without being first put into interference with McDonough, but *after* such issue to Bell an interference between Bell and McDonough was declared.

"When Mr. Donough filed his case there was *no one else in the office showing such an invention,* yet while he was patiently waiting for the issue of his patent, Mr. Bell steps in with an application, and within the brief space of 15 *days had his case issued to him,* and he has paraded before the world ever since as the original inventor. It only remained after this to get Mr. McDonough put into interference with an issued patent to hold him in the office for years, which was done.

"Thus, the man to whom *belonged the credit* of this important invention, as well as the *revenue therefrom,* has been unjustly kept out of his right for many years.

"Recently the Patent Office has allowed Mr. McDonough to divide his case, and has issued to him four controlling patents: *One for the receiving telephone, as now in general use; one for and controlling the transmitter, as now used; one for a combination of the transmitter and receiving telephone, and one for the removable diaphragm of the receiving telephone, as now in use.*

"As the *original inventor,* these patents will be sustained by the courts in their broadest scope; and while he will yet undoubtedly obtain through the same courts the broadest claims to the art covering any possible way of transmitting speech by electricity, these issued patents control the field, and will prevent others from using any of the now known methods of such transmission.

"The United States Telephone Manufacturing Company, organized under the laws of the State of New York, who are the owners of the McDonough patents, also owns the patents of George W. Coy and Charles E. Buell, of New Haven. It is a well known fact and beyond dispute that Mr. Coy was the inventor of the exchange plan or system now in use for utilizing the telephone, and which completely overcame the then existing difficulty of bring the telephone into universal use. He devised and put into operation at New Haven, Conn., the *first telephone exchange,* inventing and combining the necessary *circuits and apparatus* that has made the system so effective and popular throughout the entire world.

"Upon these new and necessary combinations he applied for letters patent, which have been granted to him; these patents cover and control, to the fullest degree, the system now employed to operate any and all of the telephonic exchanges in the United States.

"Every exchange from the smallest to the greatest are infringing these patents in a score or more of different points, and are all liable at law for damages for such infringements from the date of the patents."

The Care of Tricycles and Bicycles.

The *Wheelman,* an illustrated monthly journal published in Boston, and devoted to the interests of bicycling and tricycling, has in its September number an article on the care of the machines, which will be read with benefit to themselves by a large number of the younger members of the bicycling fraternity, and some of the older bicyclists may derive some pleasure if not profit from the writer's suggestions.

In caring for your machine, says the writer, roads, climate, and personal surroundings must, of course, be considered. Hilly, rough roads, cold weather, and a poor place of storage are all against your wheel. Your first care begins when you learn to ride—learn on "some other fellow's" wheel (provided you can find so accommodating a fellow); and when once you know how to ride, falls should not be indulged in—let the wear be simply friction. Accidents, of course, will now and then happen, the same as to a railway train or any moving object; but make it your constant thought that what damage does happen shall be accident, and not your carelessness.

Know your wheel. I find many who have ridden for months, even years, and who "swore by" the special make they were using, and yet knew nothing of taking it apart or putting together; they "had found holes for oiling, and, when anything got loose, screwed it up." When you get your mount, don't be afraid to ask questions about it; have it thoroughly explained to you how to oil, to adjust the bearings, how the wear in the various parts is "taken up," how to take out the wheels, etc. I don't suggest that you immediately take it to pieces; but know *how,* so that when necessity requires it you can do so understandingly. When you do take apart, mark each piece, have a box in which to keep the bearing balls, adjusting boxes, etc. Keep all together, and see that they are put out of the way of the children, or any one of an "inquiring turn of mind."

Have an assigned place for your wheel, the same as you would for a horse; if a club man, in the club wheel room; or if not, a place in the house, shed, or stable, where it is thoroughly dry and accessible; if possible, let this place be light, that you may see to clean and take proper care of it; before a run look over the nuts and dust caps and see that all are tight; and after turn it up on an Acme stand and clean it—if a bright machine use cotton waste and oil; if nickel, a chamois skin and a fair portion of "elbow grease." If you have a neat, light place for your wheel, you will take more pleasure in looking after it; and the better order you keep it in the more you will enjoy riding it.

Tires.—I have found that an ordinary gray Para tire will last as long as there is any life in the rubber—in an ordinary climate about seven or eight years. In our country the climate of the far West and South is most destructive to them. I have exposed a tire to the sun at 110° and in winter to 3° below zero. The heat started the cement to running, and yet with these alternating changes this tire was run three years, and is now four years old and apparently good yet. So there need be no fear of your tire giving out; yet I would suggest that in winter you give it not the coldest place; a heated room preferred. It is safe to say that a rubber tire lasts about as long as a buggy tire.

Cementing on the tire is very simple. Use any means to heat the felly with the cement in it, place your tire in evenly, and ride your wheel a few times to force it into place. Should your tire come apart at the splice, it must go to a rubber factory and be respliced. I have found none of the advertised rubber cements that would perform this service. Tires are now made continuous or of a solid mould, and the last named difficulty will thus be obviated.

Care of the Bearings.—Use good oil; take four parts of sperm to one of paraffine for a good lubricant, and use sparingly. I have run a wheel with balls to every part three hundred and twenty-eight miles with one oiling, and the second was on the seven hundred and fortieth mile; but distance is not a perfect guide, as it is better to oil a little and often. Yet I sincerely believe that most riders oil too frequently. "Now and then" fill your bearings with kerosene, and cut out any oil that may have become gummed. Keep your bearings tight, and the dust out. A little piece of kid over the vents and under the oiler spring does good service, also felt washers on pedals and rear wheel. Keep the steering bearings well oiled, and a drop at times on the spring clip and spring bolt.

Nickel.—Don't suppose for a moment that nickel won't rust! It will, unless you are careful to polish it often. When it has been wet rub it well with an oiled cloth, and then polish with chamois skin. Enamel is best for a lazy man, or one who lives or uses his wheel at tide water; and for a tricycle enamel is preferable any way.

Storage.—A bicycle can be kept nicely in a hallway; but a tricycle must have more room, and a double door to admit it, as a house seldom has doors wider than three feet. I prefer my wheel to hang by the handle bar, if possible, with both wheels clear of the ground.

If a bicycle is to be taken up stairs, take it by the handle bar, in the position of "a header," and push it up with the little wheel in the air; and to descend the same position, letting the wheel down in front of you, holding it back by the handle bar. I know some enthusiasts who keep their full nickel wheels in their parlors, taking them up and down stairs in this way.

Repairs.—If so unfortunate as to break or damage your wheel, send it to a good repair shop, where it will be trued or mended, usually at a charge of fifty cents per hour. If an ordinary "buckle," the average cost will be about three dollars. If you try your 'prentice hand you will probably fail, as truing a wheel requires one skilled in that particular branch. If you "buckle" your wheel on the road, get some one to give you a hand; usually you can spring it back in good enough shape to ride home.

Good repair shops can be found in all the large cities, but, as you value your wheel, keep away from the "village blacksmith."

The best wheel made will "buckle" upon occasion. Your care should be to see that there is no occasion. The writer came to the above conclusion when he saw an express wagon pass over his wheel.

Transportation.—By far the safest way to transport your bicycle is to ride it. Yet we all know this is not always practicable. A good crate will protect your wheel, and as one always comes with your bicycle, take care of it, and it can be used time and again. When a baggageman on the train takes your wheel, go into the car and see where it is placed; no one has the same interest in it as yourself; a trunk resting upon the driver may do much mischief, while a cigar may drive away a baggageman's wrath. It is to the interest of wheelmen to show people how to handle machines. An expressman I have in mind broke his index finger by getting it caught between the spokes and fork; and to this day a wheel is his abomination.

Don't lend, don't borrow! Keep your wheel, like your toothbrush, for your personal use. When a number use one machine, you will find that the greater the number the poorer the care it gets.

A padlock and chain keeps the wheels from moving, and you have the pleasure of knowing that you carry the key.

Periodic Changes of Temperature.

From records kept at Montpellier, France, and Brussels, Belgium, for thirty-six years in the last century and for forty years in this century, it appears that oscillations of temperature occur, probably simultaneously, over western Europe at intervals of about fourteen days, corresponding to a half rotation of the sun with respect to the earth. The French astronomer Flammarion suggests that the solar rotation may be the cause of the periodic changes of temperature, owing to some variability in the radiating power of different parts of the sun. These observations indicate that the climate of Europe has not undergone any appreciable change for a century, and if it could be ascertained whether the periodic changes observed in France and the Netherlands extend over the whole earth, a great step would be made toward an understanding of the causes of temperature changes, whether they exist upon the earth or in the sun.

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The Science of Ball Pitching.

Base-ball playing has become so common in many parts of the country, and the interest so generally taken in the college and professional contests, by the friends and champions of the players, that base-ball may be said to have become our national game, as cricket is to England. The *Philadelphia Press* has recently given the subject considerable attention, and the following it gives as the history of the *curve* as practiced by skillful pitchers of to-day:

The curve delivery in base-ball pitching was the greatest change ever introduced into the game; and in these days, when an old-time straight pitcher would be knocked out of the box in an inning, there are a good many claimants for the credit of originating it. College men, with the exception of those from Harvard, always insist that Avery brought it to light at Yale; while the Harvard men, who naturally would refuse to see a curve of two feet in a Yale pitcher's delivery, incline to the opinion that Mann, of Princeton, was first on the diamond with it. Harvard's men have grounds for their belief, from the fact that the Harvard team first had a practical sight of the curve at Princeton, in 1874; but as it did not have the effect of winning the game from them then, they regarded it more as a curiosity than anything of importance in the game. The fact was that Mann was so much excited about his new delivery that he did not know when to quit; and after the Harvard men had noticed that the ball always turned about a foot outward after leaving the pitcher's hand, they made their calculations and hammered at it accordingly. The game, up to the fifth inning was right in the hands of Princeton's catcher, who captured the men one after another as they struck out, but when Harvard began to bat the prospects changed at once, and Princeton lost by clear three runs. Mann had only one curve, and he did not even vary it by straight balls, so it failed of success against the straight pitching and fine head work of Ernst and Tyng. Avery, at Yale, came out with his curve the same year, and many of the college nines of that time remember yet how he promised something new for the Harvard batters as the result of his winter's practice in the gymnasium. He did succeed in defeating them, and next year, by his effective pitching, helped his team to the championship.

Before that time, however, curve pitching was practiced in professional games, and, though its nature was not much understood, everybody seemed to know that a peculiar kind of ball could be delivered and that Matthews, the present "curver" for the Athletics, was the man who was doing it. Arthur Cummings, who played in the Mutuals in 1872 and in the Stars, of Brooklyn, in the years preceding, also was known to pitch a deceptive ball, but, as he quit playing professionally about 1874, his work was gradually forgotten and Matthews gives all the credit for the innovation.

Matthews himself says that Cummings was curving the ball before he knew anything about it, and he gives further credit to Cummings by adding that he got his first lessons in the art by watching the Mutual pitcher's delivery.

In those days, when the first professional association was just getting on its feet, there were no cast iron regulations about where the players should sit or stand, and very often a whole team stood close around the batter, giving him points when they could, and spending the remainder of the time in "chaffing" with the umpire or pitcher. Cummings' delivery was known to every man in the profession as very peculiar, and Matthews, whose straight work was beginning to give way before it, made up his mind to take advantage of a position near the bat to learn the secret. He watched Cummings' hands carefully, noting how he held the ball, and how he let it go, and after a few weeks' careful practice in the same way could see the curve in his own delivery. Then he began to use it in matches, striking men out in a way that no one but Cummings had ever done before, and in a short time he was known as one of the most effective pitchers in the field. To-day he is pitching the same old curve, with all the tricks in delivery that years on the diamond have taught, and the batters don't seem to hit him much better than they used to.

Other pitchers had to take up the curve or quit playing, just as McBride and Pratt did, and before the Centennial the regular craze for curve pitching had set in which finally forced both League and Association managers to abolish old pitching rules and allow any throwing delivery which would assist in puzzling the batsmen. Every pitcher was popularly supposed to have a choice selection of curves which he sent in at pleasure, and his value was usually reckoned on the number of different ones he could use. That idea, by the way, is still prevalent, and there are many people who believe in an "up" curve and a "down" curve, an "in" curve and an "out" curve, a zigzag and a "double" curve, and "shoots" and "jumps," and fast and slow balls to match.

"That's all a mistake," said Matthews, while talking over some of his experiences. "I never saw but one curve, and never made any more. Of course a ball will shoot in a little distance, but you can't call it a curve, because you can't hold that kind of a ball so as to make a curve out of it. The only genuine curve is the one which turns out from the batsman, but after two or three of that kind a straight ball, if it is properly pitched, looks as if it was turning the other way. 'Drop' balls, or balls which apparently shoot or curve downward, are all deceptive work, and are thrown from the highest start the rules allow. Rising balls are the same thing, started from as near the ground as possible, and pitched upward. 'Slowed' balls are started slow, with an apparently fast flourish, for if they were ever started fast I don't know what skill could hold them back, and, as to balls which go both in and out, why, that is a manifest impossibility. I know there have been several tests made of that, one particularly at Cincinnati, where four posts were put up and the pitcher required to make the ball go on one side of one and the other side of the next, but I don't think he did it. If he did, it was through some deception in regard to the place where he was standing. No, sir. Good, straight pitching, thorough command over the ball, a good out 'curve,' and a good in 'shoot' are what the great pitchers are working with to-day, and I, for my part, don't believe in anything else."

Dereliction in the Tanning Business.

The failures thus far in 1883 in this industry, and among old and large firms, cannot but have been a great surprise to most business men in other lines of trade. They exceed in number and magnitude anything of the kind which has happened within a generation, and probably there never has been a year within the history of the trade in this country so fraught with disaster to those connected with the business of manufacturing sole leather. Manufacturers of cotton and wool, iron and other metal workers, and jobbers and merchants generally, have been accustomed for years to look upon the sole leather business as among the most "solid" of our industries, and the banks and note brokers have been only too glad to take all of this class of paper offering, at the lowest market rates, through many periods when leading houses in other industries have been severely crippled by the stringency of the money market. But with several large failures early in the year, and the recent gigantic one in Boston—where the largest firm of sole leather manufacturers in the world has gone down, with liabilities of nearly ten million dollars—all this has been vastly changed; the banks, note dealers, money lenders, and hide importers have been heavy losers, and the outside public find it difficult to understand how such disasters could occur in one of our staple industries when most others are prosperous.

Perhaps, however, a little looking into the nature and peculiarities of the business will give a better understanding of the situation. There are few people who realize that, notwithstanding all our modern improvements, it usually takes as long to make a side of sole leather as is ordinarily required to build a ship, although such is the fact. From the purchase of the raw hide until it is returned to the store as leather, it has been usual to average the time in the trade at about eight months; all of this time is not required in actual tanning—although in some heavy leather as long as this is required in the manufacture—but there are many unavoidable delays in the business. With this long period, then, between the first and principal investment of capital in the raw material and the completion of a marketable product, it will be readily seen that there may be—as there often are—such wide changes in the value of leather as will either give the tanner a large profit or net him an inevitable loss, even with the wisest management. And this, too, has been so common in the trade that the best houses seldom congratulate themselves on the profitable business of a year or two, or take blame for the reverse, but rather on the average of their profit and loss for a series of five or ten years, so that the making of sole leather seems to have very properly come to be designated as a "long" manufacture, as it is commonly styled.

In cotton, wool, silk, iron, and nearly every other manufacture, the raw materials are produced directly with a view to the market therefor, and the slightest variations in their price are immediately seen in corresponding changes in the value of the finished goods. But hides are only a by-product. Cattle are never killed now in order that the tanner may buy their hides, although this *was* one reason some years ago in Texas and Buenos Ayres, when a small proportion were killed principally for the hide and tallow. The supply of raw material for the tanner is, therefore, neither greater nor less, whether the price be high or low, except as values may vary in different countries, when the highest rates will bring the greatest abundance in special localities. In most of the other great industries, too, the production is concentrated in but few places, compared with the way in which our tanneries are spread out all over the country, so that, with the uncertainty attending any calculation of the supply of raw material, or the actual amount of leather at any one time in process of manufacture, and with a money market particularly easy for leather firms wanting to borrow, the practical result has been that, beginning with the high prices for sole leather in 1879, there has been such undue competition for hides as to keep their cost abnormally high, while the production of leather has been so great as to make it impossible for any but a few of the best tanners to make a profit in the business.

It is evident, from the foregoing facts, that overproduction is not likely to be so quickly checked in the leather trade as in most other lines of business. In stopping textile manufactures the greatest loss is in interest, and this is often overbalanced by the opportunity afforded for repairs; to stop a blast furnace is more detrimental, but not in these, or any of our industries, are the results of "shutting down" so serious as with the tanner. In the first place he has always to supply himself with bark for the year in the brief bark peeling period, but this bark greatly deteriorates in value if kept much more than a year; then the liquor in the vats, in case of stoppage, rapidly sours and becomes useless, the leather in process of tanning is greatly injured, and the whole plant is reduced in value far more rapidly than is the case in any other manufacture. The large and steady demand for our sole leather for export, and the undoubtedly healthy condition of our boot and shoe business, have kept up the faith and stimulated the production of tanners through three years in which the business has been generally unprofitable; but these great failures certainly seem to indicate the urgent necessity of so limiting production that a fair profit may be realized, which would come as surely from a natural decline in the price of hides, under a less active demand, as from an advance in leather.

New Statistics of Vaccination.

Our readers are well acquainted, says the *Pacific Medical Journal*, with the herculean struggle of the British anti-vaccinationists, now continued for ten or fifteen years, directed against the compulsory vaccination law. From year to year the movement has been gaining strength. Societies have been organized in all quarters, periodicals established, funds largely contributed, and many of the leading men and women of England, including not a few of the nobility, enlisted in the enterprise. Judging from the clamor that filled the air, the heart and head of the kingdom were gained over to the humane enterprise. At last the long travail of the mountain culminated in the introduction of the repealing bill in the House of Commons. The hour of promise was come, and a triumphant majority of the representatives of the people of Great Britain would reward the labors and verify the sanguine predictions of the anti-vaccinationists. The vote was taken; of 302 members present, 16 voted for repeal and 286 against! "Ridiculus mus!" It is probable that a majority of the sixteen were favorable to vaccination, but, like John Bright, hostile to the compulsory clause; so that a vote on the merits of vaccination simply would have found not more than eight of the members opposed to it.

The advocates of vaccination were prepared for the contest. Sir Lyon Playfair led the way by showing that whereas in the last century the annual deaths from small pox in England and Wales averaged 3,000 in the million of population, in the forty years of the voluntary vaccination that followed, the average was 600 in the million; that in the period from 1841 to 1854, when gratuitous vaccination was introduced, the average fell to 305; that under the first obligatory act from 1854 to 1871 there was a further reduction to 203; and that from 1871 to 1883, the time during which the present compulsory law had been in operation, the average had been reduced to 156 in the million.

Dr. Cameron said that in the last fifty years, out of 27,215 ascertained cases of vaccination and non-vaccination, in 8,600 cases of non-vaccination the deaths were 3,400, or 40 per cent, while of the remaining 18,515 cases of vaccination the deaths were only at the rate of 7½ per cent. Sir Charles Dilke, Secretary of the Local Government Board, also came to the support of vaccination with some interesting figures. There were 10,504 persons, he said, employed in the London Postal Service, all of whom were required to be vaccinated on entering the service, unless the operation had been performed within seven years previously. In the ten years from 1870 to 1880 there had not been a single case of death from small pox in this force, and although there had been an epidemic during that period there had been only ten cases among the men, and they very slight.

Another point, which, we presume, was not overlooked in the discussion, though no mention is made of it in the account before us, relates to the deformity among those who survived. In his sketch of Oliver Goldsmith, Thackeray mentions that the disease "fell afoul of the poor little child's face when he was eight years old and left him scarred and disfigured for life." At the same time, he adds, the "small pox scourged all Europe and ravaged the roses off the cheeks of half the world." Persons now living can recollect the pock-marked faces which abounded among foreigners in the first quarter of the present century, particularly among immigrants from Ireland. At the present date a pock-marked face is comparatively rare.

Terrible Volcanic Destruction.

The island of Java suffered a dreadful visitation by volcanic outbreak, accompanied by subaqueous earthquake, August 25 and 26, by which the loss of life is estimated at not less than 75,000, and a large extent of territory was sunk under the sea, believed to cover an extent of fifty miles square, containing three towns and a number of agricultural villages. The navigation of the Strait of Sunda is also rendered difficult by the destruction of lighthouses and the change in the shore lines by the subsidence of the land. These are the items sent to Lloyd's, London, by telegraph; but the Netherlands Trading Company's representative in London has dispatches of the same date which seem to reduce the extent of the catastrophe considerably.

Effect of Peculiar Perspiration.

An exchange mentions as a curious instance of the slight causes which promote oxidation, the experience of a manufacturer of fine cutlery, who found at one time a large portion of his goods being returned to him as in damaged condition. Instead of bright, clean surfaces he found rusty, deeply oxidized blades. After much watching to determine the cause, it was located upon the man who sorted and wrapped the knives in packages. Everything he touched was found to rust, from the peculiar acid character of his skin exhalations.

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ENGINEERING INVENTIONS.

Mr. W. B. Turman, of Waldron, Ark., is the patentee of an improved valve gear for steam engines constructed to allow convenient reversal of the engine, and for regulating the amount of steam admitted to the steam chamber.

Mr. Isaac Cumberbatch, of Newark, N. J., is the patentee of an ingenious device for regulating the draught in a steam boiler. At the top of the boiler is located a hollow cylinder which connects with the boiler and has a movable rod passing through its center, which is connected with the top of a series of disks in such a way that as the steam is admitted the rod will be raised proportionately to the steam pressures, and the damper in the flue of the boiler which is connected with this rod by a series of levers will be correspondingly closed and the draught diminished.

An improved steam engine in which the dead center point is obviated has been patented by Mr. Carl Baumgarten, of Berlin, Germany. A block is secured to the piston rod, whicir block is provided with a diagonal slot through which the crank pin passes. The slot has concaved edges facing each other and is provided with a recess at each end. The slide valve is attached to a rod provided at the lower ends with tappets, against which the ends of the sliding block strike, thereby reciprocating the slide valve rod. The levers from which the rods are suspended are provided with spring arms for giving the desired degree of expansion.

A device for regulating the valve or cock in the pressure pipe of a Westinghouse brake has recently been patented by Messrs. Albert Thayer and M. J. Connelly, of Roxbury, Mass. The cock for permitting the air to pass out of the pressure pipe is provided with a weighted lever which is operated by a cord extending to the engine box. The compressed air cylinder is connected with this lever by the rod of the piston, so that when the cord is pulled the piston will be raised, and the cock or valve in the pressure pipe will be closed as the air escapes gradually through an aperture in the piston head. The time required for the closing of the cock depends upon the size of the aperture in the piston head.

MECHANICAL INVENTIONS.

The Hamilton Lead Bath Company, of New York city, by assignment from Mr. Henry T. Vanderhoof, have recently obtained a patent for an improved amalgamator. A caldron of molten lead is provided, and into this lead an endless chain of buckets conveys the ore down into the molten lead, where it is distributed and the process of amalgamating is effected.

Mr. William N. Mills, of Truro, Nova Scotia, Canada, has patented a knob attachment to facilitate the locking operation and avoid the troublesome application of a screw to hold the pawl in place. A pawl spring connects the knobs to the spindle. It consists of the bow spring provided with a shank having a lip to adapt it to be applied to and held between the knob and spindle.

Mr. Abram N. Ackerman, of Passaic, N. J., has obtained a patent for an improvement upon gudgeon rollers such as are commonly used in machinery employed in the manufacture of paper or textile goods. The end of the roller is provided with a metal bushing through which the gudgeon is passed, when it is inserted into the end of the roller and is held fast by the expansion of the central portion of the bushing, rendering the roller exceedingly strong and durable.

An improved vertical disk grinding mill has been patented by Mr. Henry Cutler, of North Wilbraham, Mass. This is a self-adjusting mill constructed with the bed stone firmly set in a strong iron case, from which it need never be moved until entirely worn off. The running stone is attached firmly to a spindle. The case has journals or trunnions which are fitted in a housing frame standing on the base, which has a vertical center pivot or journal, on which the frame may turn or adjust horizontally. The case also has a bracket in which the spindle has a bearing at one end, so as to turn with the case, while the other end of the spindle, on which the driving pulley is mounted, has a bearing in a standard, which is secured to the foundation independently of the stone supporting frame, so that the spindle stones, case, and bearings may all turn on a single pivot to line properly with the bearing, as it may wear laterally by the pull of the belt. At the same time the trunnions allow the case to shift vertically, so as always to line with the spindle bearing, no matter how much it may wear vertically.

AGRICULTURAL INVENTIONS.

A very simple and easily constructed hay and cotton press has recently been patented by Mr. John Cocke, Jr., of Greensborough, Ala. The press is worked by forcing the follower block against the material by means of hand levers, thus forming the bale.

Mr. W. R. White, of Aurora, Neb., has recently patented a simple, effective, and inexpensive seed planter for planting corn and other seed in hills, or by drilling in rows. The invention consists of certain novel devices for operating the feed slide, and in improvements in some other parts of the machine.

Mr. M. L. Battle, of Bainbridge, Ga., has patented an improvement in plows. The plow plate is formed with a heel plate, having its rear end slotted, and provided with lugs to receive a bolt for fastening the plow to the standard of a plow stock. The plow plate is strengthened against the pressure of the soil by braces extending from its upper part to the heel plate and to the plow beam.

Messrs. O. H. Judd, of Fairfield, Neb., and C. W. Judd, of Meadville, Pa., are the patentees of a weed and grass turning attachment for plows consisting of a lever having a spring arm with a curved bar pivoted to the furrow side of the plow beam, and extending in a bow shape to near the bottom of the furrow previously made. The bar is located a suitable distance in advance of the mould board to catch the grass, weeds, or other growing crop, bending it over into the furrow, so as to be effectually covered. This attachment is also contrived to be adjusted higher or lower for different conditions. By means of a spring lever it is held to its work, so as to yield in case of too much resistance, and for raising it up to shift the plow.

An improved pulverizing, seeding, and fertilizing harrow has been patented by Mr. John Stephens, of Hanoverton, O. This harrow has revolving drums similar to rollers, except that the shells are of flat sections of planks in which the teeth are inserted by screwing through the planks into a metal bar. Each plank or section has one row of teeth, and the planks are suitably secured to cast iron heads which are journaled in frame bars to which the tongue is secured, and which extends beyond the back of the drums and have a connecting bar behind them to balance the tongues. For a means of readily transporting this harrow, wheel rims made in sections, jointed together, and fitted with right and left connecting screws, together with detachable bracket arms, are connected with the drums.

A very convenient device for receiving hay, transporting it to the stack, and for depositing the hay upon the stack, has been patented by Mr. T. L. Vought, of Madelia, Minn. The frame is mounted upon high wheels at one end and rollers at the other. A tilting frame upon which the hay is pitched and transported is elevated by a rope passing over a windlass, when the place is reached for depositing the hay in the stack. The same inventor has also obtained a patent for a very simple and easily constructed press for forming and compressing cornstalks, straw, etc., into bundles to be employed as fuel. This press is provided with the ordinary press box, and with a follower which is actuated by a pointed lever, that engages with the teeth of a ratchet bar, and a knife is pivoted at one end of the frame for cutting the bundle into any desired length according to the size of the furnace in which it is to be used. The machine may be also used as a straw cutter for preparing feed for stock.

MISCELLANEOUS INVENTIONS.

Mr. Moses Cook, of Ashfield, Mass., is the patentee of an improved folding table, which is readily adjusted when required for use, but which may be folded into a small compass and laid aside when not in use.

Mr. Thos. Henderson, of Nashville, Tenn., has patented a simple and effective flushing tank for water closets, urinals, etc., in which a siphon is used in an ingenious manner for conveying the water from the tank to the bowl of the closet or urinal.

A monthly calendar composed of a rotating disk having a peculiar arrangement of figures, which is combined with a card or frame having an opening for exposing a portion of the disk, has recently been patented by Mr. C. H. Dana, Jr., of West Lebanon, N. H.

Mr. Paul Otto Kessler, of Darien, Ga., has patented a cartridge shell made with lugs upon the inner surface of its base, and angular slots in the flange of the cover, and provided with a spring catch, whereby the cover will be held from being drawn off the shell, and will be locked from turning.

Mr. Andrew F. Baum, of Allentown, Pa., has obtained a patent for an improvement in shirt bosoms, and the manner of attaching them to the shirt body, the object being to provide a bosom which, shall always take and preserve a high finish when laundered, and at the same time admit of the greatest freedom of movement of the wearer without wrinkling the bosom.

Mr. James N. Dudley, of Petrolia, Cal., is the patentee of an improved saw handle by which the connection of two handles by one socket enables both hands to be used to better advantage than with one handle. The saw handle socket is made with a T-shaped slit on its opposite sides to form a spring clamp, and the parts are expansible to receive the handle.

Mr. N. D. Swift, of Petrolia, Ontario, Canada, has secured letters patent for a "table tray" used for preventing children from dropping food upon and soiling the table cloth while eating at the table. It is fastened to the table by a thumb screw, and is of a form that extends from the table and fits around the front of the child.

Mr. Edwin Ivey and Andrew Uren, of Seattle, Wash. Ter., have patented a device for holding oil cans or like vessels in such a manner that they can be easily tilted and the liquid drawn. The invention further consists of a can with inverted V-shaped standards, of a U-shaped shaft journaled in the same, braces, and a can holding frame formed on the shaft.

Mr. J. T. B. Lee, of Toronto, Canada, is the patentee of an improved mop holder. The jaws for holding the mop are hinged at one end, and when closed with the mop between the jaws, the latter are secured by a cam lever which not only holds the jaws firmly, but they can be quickly opened to release the mop.

Mr. F. J. Evans, of Iowa Falls, Iowa, has patented a magazine breech-loading firearm of the class in which the breech is opened by a breech block sliding longitudinally with reference to the barrel, and consisting in novel features of construction and arrangement both of the breech block and cartridge elevator and the mechanism for operating them.

Mr. William J. Devers, of Providence, Pa., has obtained a patent for an improved extension table which consists in a stationary and a movable section, the movable section being moved by a rope which passes over a pulley under the table top, and is provided further with a lever for starting the section, and for relieving the strain to a certain extent from the rope.

Messrs. John H. Bonn, of Weehawken, and Alfred De Bevoise, of West Hoboken, N. J., have patented a combined chair, knee, and truss bracket, consisting of a trough-shaped box, and a transverse inverted trough-shaped box, the said boxes being made integral and the upper one provided with strengthening ribs.

For the convenience of builders, machinists, and others who have occasion to use a plumb and level, Mr. Bozwell B. Butt, of Richmond, Va., has patented an instrument which he calls a right angle level. By applying the instrument at the corner of the timber it plumbs two ways at the same time. The level may be also used as an inclinometer.

Mr. Wilhelm Ludowici, of Ludwigshafen-on-the-Rhine, Germany, has patented an improved roofing tile, in which very close joints are formed which conduct off all water, and cannot be raised by wind. The tiles are so constructed as to prevent the wind from driving the rain through the joints, and are very light and durable, and can be attached to the roof very easily.

An improved method of making small shovels or scoops used about stoves and ranges for replenishing the latter with coal or relieving them of their ashes, has been recently patented by Mr. C. K. Edwards, of Boston, Mass. The scoop portion is made from one piece of metal, and by having the raised back of double thickness of metal, the strength and durability of the shovel is greatly increased.

A very simple and portable fire escape has recently been patented by Mr. Horace D'B. Cutler, of Glenwood, Mo. This consists in a broad leather belt designed to be passed around the chest of a person under the arms, and having a metal back to which are attached several hooks in such relation to one another that proper friction will be secured to insure the safe descent of the person wearing the belt.

Mr. Peter Smith, of Cato, Kas., has patented an improved fire escape which consists of suspending a strong canvas web between benches by weighted cords, which will yield to the stress of persons jumping from buildings on to the canvas. A safe means of landing is effected by the large measure of relief the rising weights lend to the canvas, greatly relieving the shock to the person jumping upon it.

Mr. Charles Egan, of Zanesville, O., has recently patented some improvements in telephones for transmitting sound and speech. A duplex instrument is formed of two magneto-telephones, one in the main line circuit, the other in a local circuit, which are operated by electrical contact points controlled by the diaphragm of the main line instrument. Communication is received and transmitted through one and the same mouthpiece.

An automatic stove damper, graduated in the extent of the opening for the escape of the products of combustion, has recently been patented by Mr. J. C. Higdon, of Kansas City, Mo. The damper rests upon a vertical projection and is supplied with an adjustable weight which slides upon a lever. When the draught becomes too strong, by reason of too rapid combustion, the damper is raised and the draught stopped, and when the heat subsides the damper gradually opens again, allowing the products of combustion to escape.

An ingenious method of ornamenting walls, ceilings, paper hangings, etc., has recently been patented by Messrs. Gustav Giersberg and Richard Wirth, of New York city. This invention consists in preparing the wall with a thin layer of plastic material consisting of white lead, whiting, plaster of Paris, and oil of turpentine, and producing relief ornaments of various designs upon this plastic mass by means of combs or other suitable implements.

A very novel device for facilitating the measuring and fitting of dresses, and adapted to be used by persons unaccustomed to such work, has been patented by Mr. Jean Monjou, of Paris, France. This consists in making a jacket or bodice out of elastic bands which will yield equally in all directions, and adapt themselves perfectly to the figure of the person who is being measured, and will thus enable the fitter to take exact measurements of all the different parts with great facility and accuracy.

Messrs. James A. Holbrook and Ginet Montgelas, of Grenoble, France, have obtained a patent for an improved glove blank, in which the opening for the thumb piece is not cut in the body of the skin or leather in the usual manner, but is formed by partially uniting the edges of the pattern on the inner side of the hand, whereby the glove will be greatly strengthened, and will not be likely to rip or tear at this point, and at the same time the skin or kid will be cut in the most economical manner.

Mr. Franklin Pierce, of New York city, has obtained a patent for a hod elevator which is an improvement upon a patent granted Nov. 7, 1882. The elevator is provided with a frame having a cross bar with hooks for supporting the hods when placed in the frame, and this is so constructed that when the elevator has been raised to the necessary height the cross bar may be lowered by an attendant, permitting the hods to be swung out without the necessity of their being raised off the hooks by the workmen, and thus saving a great amount of labor.

A novelty in ornaments and trimmings of chenille—for instance, such ornaments as branches and twigs of leaves and flowers, rosettes, hat bands, and other ornaments—has been patented by Messrs. George Dietzel and Samuel Green, of New York city. The invention consists in ornaments formed of pieces of chenille having a varying diameter or wefts of different lengths, which pieces of chenille are secured to steams or branches. Overspun balls, pellets, beads, or tufts can also be suspended from the stems by means of cords, in addition to the pieces of chenille.

An improved dumping cart has recently been patented which embodies several improvements over those commonly in use. The body of the cart is mounted in such fashion upon boxes on the axles of the cart that it may be swung underneath the cart sufficiently far to clear the body completely of its contents. This obviates the necessity of employing a back board and greatly facilitates and expedites the operation of dumping. A simple device in the form of a hasp and latch is employed for securing and locking the body when being loaded. Mr. Thomas Hill, of Jersey City, N. J., is the patentee of the above invention.

An improved memorandum pointer has been patented by Mr. Alexander J. Young, of Atlanta, Ga. This invention is designed to provide means whereby a person who is suddenly called away from reading or from adding a column of figures, may mark the place where he left off without defacing the book; and, further, to provide means for recording the sum of the addition at the place marked. To the retail store keeper, and to others who are liable to be interrupted while posting books, and to those who are reading any book with care, this device for indicating the point of interruption and for holding a record of the matter in mind at that moment is of great importance.

Among the recent improvements in fire escapes we note the invention of Mr. Madison M. Orms by, of David City, Neb., for which letters patent have been granted him. A series of platforms are arranged to be raised vertically in the frame of the apparatus, and these platforms are provided at their outer ends with ladders to be inserted in the windows of the burning building, and a vertical ladder is provided for connecting the different platforms. These platforms are raised by means of windlasses located at the base of the escape near the ground, and the top platform is provided with an extension ladder which may be raised to a considerable height above the platform by means of suitable ropes and pulleys.

Mr. J. J. De Rycke, of New York city, has obtained a patent for an adjustable elevator platform for vessels carrying railroad cars. In this invention the platform may be raised for bringing the cars on the level of the dock according to the condition of the tide. The platform is raised by a number of vertical screw spindles mounted upon the bottom of the vessel, and having worm wheels at their lower extremities which engage with transverse shafts which in turn are actuated by a shaft driven by any suitable motor. In this way the spindles are all rotated simultaneously and the platform is elevated or lowered to the same extent at every point.

Mr. James J. Bush, of Tacoma, Wash. Ter., has obtained a patent for an improved vehicle wheel which is so constructed that it may be readily adjusted to the tire, and new spokes may be easily inserted when necessary. With a wheel constructed as described the tire can always be kept tight, and if it should get off can readily be put on by any person unskilled in such work. Provision is made for either expanding or contracting the wheel to its tire on the road, and in a few minutes of time. In case of a broken spoke a new one may be inserted with equal facility. It is designed to have all spokes turned to a gauge, and marked with a number corresponding to the size of the wheel they are designed for, and to similarly mark the hub. Whenever such parts require to be replaced, duplicates of such parts may be ordered, and be sure to fit. By thus making the wheels with their parts in duplicate, the same may be very cheaply manufactured.

Mr. Solomon M. Eiseman, of New York city, has patented a process for treating volatile or inflammable fluids and oils, such as petroleum, kerosene, turpentine, and any of their manufactured products, including the most volatile and inflammable—such as gasoline, etc., whether they are of light or heavy specific gravity, of mineral, vegetable, or animal origin—in such a manner that they will be converted into a granulated state. The invention consists in mixing the volatile or inflammable fluid or oil with a fatty substance or substances, together with a suitable acid. When the proper incorporation and combination of the substances is effected, the fluid or oil thus obtained is thoroughly mixed with a suitable cold alkaline lye, which causes an almost immediate coagulation or granulation of the inflammable and volatile fluid or oil treated.

An improved aligner for type writers has been patented by Mr. Charles J. Baker, of Topeka, Kas. This invention consists, in connection with a type writer, of an aligner bar having a slot and letters or type. The method of aligning the type by this device is as follows: A type is found by trial that will fairly strike the platen—the plane where the letters are impressed on the paper. This type is then taken as the key to the series of type to be aligned. The aligner is then put on and adjusted by said type and clamped to the machine. The remaining arms are then brought so that the type will similarly strike the plane of the platen. Said type are then adjusted all alike by setting them alike with respect to the letters on the aligner. Each type writer arm works in a suitable chair, and each chair is attached to the margin of a type writer basket by means of a screw passing through said chair into the bed plate of the machine. When said screw is loosened, the type arm is free to describe an arc, either in a vertical or horizontal direction, and also has a lateral motion, enabling the requisite adjustments to be made.

An improvement in casting car wheels has been patented by Mr. William Wilmington, of Toledo, O. This invention has special reference to the application to the chill of materials for modifying the chill-hardening qualities of the iron forming the central parts of the wheel. Heretofore this inventor has practiced different methods of modifying the chilling qualities of the iron, forming these parts of the wheel by placing in the receiving basin of the mould, or in a pouring ladle, finely powdered ferro-manganese, or its equivalents in other powdered metals, the same to be melted by contact with the molten iron in the basin or in the ladle, and conveyed into the mould by different methods, to be diffused through the molten iron forming the central portions of the wheel. These different methods have produced very beneficial results upon the car wheels, but are attended with much cost and delay when casting the wheels. The present method consists in affixing to the desired portions of the outer surfaces of the cores of the mould, by suitable adhesive compositions used in foundry work, about half a pound of very finely powdered ferro-manganese having a large per cent of carbon and silicon in its composition, allowing the same to be melted by the molten iron which comes in contact with the ferro-manganese, when the mould is being filled, which ferro-manganese, being melted, will be diffused through the hub and inner plate parts of the wheel, thereby modifying the chilling qualities of the iron forming these parts, and preventing the same from being too hard and rigid. To accomplish the same result in modifying the chilling qualities of iron in these parts of the wheel the inventor uses, instead of ferro-manganese, very finely powdered spiegeleisen having a large per cent of carbon, silicon, and manganese in its composition.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Betancourt's Rotary Plow, illustrated on page 146, is for sale. See notice for address.

Use King's Office Pen, patented July 31, 1883. Superior to all others. Price, $1 per gross, mailed free of postage. One dozen pens sent as samples on receipt of 10 cents. Geo. F. King & Merrill, 29 Hawley Street, Boston, Mass.

New scientific books on Steam, the Steam Engine, Mechanics, and Engineering. Send for catalogues before purchasing. F. Keppy, Publisher, Bridgeport, Conn.

Steam Pipe and Boiler Covering, Roofing Paints, Prepared Roofing, and general line of Asbestos materials. Phil Carey & Co., 127 Central Avenue, Cincinnati, O.

Telescope. 14″ diam., $450. T., 835 Linden St., Camden, N. J.

Wanted.—Partner for the manufacture of four useful articles from sheet metal. Also for sale, or on royalty. Address L. B. 456, Jamaica (L. I.), N. Y.

For Sale.—Steel Fig's., $1. S. M. York, Cleveland, O.

Lightning Screw Plates, Labor-saving Tools, p. 140.

Microscopes, Microscopic Mounting Instruments, and Materials. Send for catalogue. Queen & Co., Phila.

25″ Lathes of the best design. Calvin Carr's Cornice Machinery. G. A. Ohl & Co., East Newark, N. J.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Blake's Patent Belt Studs. Most reliable fastening for rubber and leather belts. Greene, Tweed & Co., N.Y

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven. Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St.. Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Spy Glasses, Telescopes, Opera Glasses, Field Glasses. Send for catalogue. Queen & Co., Philadelphia.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia. Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co. Publishers, New York.

Improved Skinner Portable Engines. Erie. Pa.

Steam Pumps. See adv. Smith, Vaile & Co., p. 93.

Drop Forgings. Billings & Spencer Co. See adv., p. 109.

Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 158.

The Sweetland Chuck. See illus. adv., p. 110

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Hollar's Safe and Lock Co., York, Pa., manufacturers of improved Fire and Burglar-proof Safes, Bank and Safe Deposit Vaults and Locks. See adv. p. 126.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv. page 141.

Curtis Pressure Regulator and Steam Trap. See p.142.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

For Pat. Safety Elevators, Hoisting Engines. Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 140.

Gould & Eberhardt's Machinists' Tools. See adv., p. 141.

Nickel Anodes, Salts, and Platers' Supplies of all kinds. Greene, Tweed & Co., 118 Chambers St., N. Y.

Barrel, Keg, Hogshead, Stave Mach'y. See ad., p. 142.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

Helios, Blue Process, Paper; the best made; warranted. Sold at all stationers, or Keuffel & Esser, New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.140.

Aneroid Barometers, Mercurial Barometers, Thermometers, Anemometers, Hydrometers, Hygrometers. Send for catalogue. Queen & Co., Philadelphia.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 140.

For best low price Planer and Matcher. and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 142.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

NEW BOOKS AND PUBLICATIONS.

FARLEY'S DIRECTORY OF THE HARDWARE TRADE. Farley, Paul, and Baker, Philadelphia.

This is a handsome octavo volume for office use, giving the addresses of the prominent hardware dealers throughout the country. The index and advertisements cover much more than the ordinary directory addresses, being guides to the most important manufacturers of hardware in the country.

DICTIONARY OF USEFUL ANIMALS AND THEIR PRODUCTS. By P. L. Simmonds, author of the "Commercial Products of the Vegetable Kingdom;" the "Commercial Products of the Sea," etc. Published by E. and F. N. Spon, London and New York.

This volume is a handy pocket book, containing in dictionary form a large amount of convenient information in its double columned pages, in relation to animals and their food, and other products of use to man drawn from animal sources.

HYDRAULIC TABLES, FOR THE CALCULATION OF THE DISCHARGE THROUGH SEWERS, PIPES, AND CONDUITS. By P. J. Flynn, C.E. D. Van Nostrand, New York.

These tables are based on Kutter's formula, and are reprinted from Van Nostrand's Magazine. The volume is intended to facilitate the calculation of velocities, the discharges, the slopes, and the dimensions of sewers; and the tables are calculated for circular and egg shaped sewers and conduits, giving their outside as well as inside dimensions, and providing a basis for calculation for amount of materials.

THE CHICAGO HERALD COOKING SCHOOL. By Jessup Whitehead, author of "The Oven and the Range" and other books. *Daily Herald* Publication, Chicago, Ill.

The writer of this handsome illustrated octavo of 126 pages with an analytical index of 100 more pages, is evidently a professional cook, and probably a "home man." There is a flavor of appreciation in his descriptions that cannot be assumed. The author is evidently a lover of the good things he so pleasantly describes. The recipes are plain and easily followed.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. G. H. writes: About ten days since the chief engineer of our fire department made a test of the water pipes, the conditions about as follows: Four hydrants were opened at the same time, with the following streams: 1⅛ inch, 1¼ inch, 1 inch, three-fourths of an inch, and shut off as nearly as possible together and as quick as it could be done. The pressure was or is 135 pounds per inch. How much would it increase by shutting off as was done? As there is considerable argument on the subject, some think the pressure would only return to the same point at which it was when the hydrants were opened, others, it would be more, and we have decided to leave it to you. The hydrants were supplied by a 6 and 4 inch main. A. Sudden shutting off of outlets in long mains is considered injurious, as it subjects the pipes and valves in the vicinity to what is called a water ram by causing a great and sudden increase of pressure, due to the momentum of the water under motion. The usual construction of hydrants is intended to prevent sudden shutting off, by the use of a screw. The amount of increase of pressure depends entirely upon the length and comparative size of the main and the suddeness of shutting off. Under extreme conditions, such as an opening nearly the size of the main and shutting off with a large cock instead of a screw valve, the water ram would carry up the pressure to two or three times the original pressure, or burst the pipe.

(2) G. S. writes: I have a cellar, 10x12x6, out in the country—Jefferson—which is dug three feet in the ground, no ditches in the neighborhood, which always contains soil water, it was masoned with the wrong sort of water lime, I understand. How can I make it water tight, and what can it cost? A. If your cellar is in the low prairie that is water soaked, hydraulic lime will not save it. Such cellars have to be built of brick saturated with asphalt, sides and bottom. This is somewhat difficult even here, where there are professional water tight cellar builders Better raise the whole cellar above water level, or cut a drain if possible. 2. The inside of my house was grained and varnished; the varnish sticks everywhere; I was told said varnish was thinned down with oil, and I varnished it over with good varnish but without any avail; it still sticks and I can not remedy it, how can I harden it? A. For your sticky varnish clean it off thoroughly with turpentine, and revarnish with good varnish thinned with turpentine, with a little drier added.

(3) J. writes: I want to lay a wrought iron pipe 800 feet long from a pond to supply a 4 inch stand pipe for a hydraulic ram. This pipe I want to lay as a siphon to carry the water over a hill, lifting the water ten feet. The lower leg of siphon to be six feet below the water in the pond. How large a pipe must be laid to carry six gallons per minute? Will air get in and stop the siphon, or will it be constant in action? A. Theoretically a pipe 1½ inches diameter should furnish more than 6 gallons per minute; but we would advise not less than 1¾ inch pipe, as you cannot rely upon the pipe being perfectly tight. If there be leaks in the pipe, air will likely accumulate in the highest point, and at that point there should be a stop cock or plug, by which the air can be let off and the pipe recharged.

(4) H. D. M. asks: What sort of a wheel and what polishing powder do I want for polishing agates? A. A felt buff, and rouge used wet. Buffs and rouge can be had at any jeweler's tool store. The grinding to a required surface can be done upon a grindstone. Grind with the stone very wet. If much is to be cut off, a copper or lead lap with emery and water will do the work quickly. The splitting by sawing is a tedious process, and hardly pays for an amateur. It can be done with a thin copper disk supplied with emery and water. It is better to get a lapidary to split with a diamond disk. You can split many minerals with a chisel and hammer by a little management. Agates will split fairly in various directions.

(5) J. E. L. writes: We have now in use a 48 inch "Stout, Mills, and Temple" turbine wheel, with 72 inch flume, 36 inch draught tube. Now if we replace the 48 inch wheel with a 60 inch wheel, will we get more power, and will we use more water, and will there be any change in speed? A. You would get no more power with the 60 inch than with the 48 inch wheel, using the same amount of water. The periphery of the 60 inch must run the same as the 48 inch, so the revolution would be reduced as 48 to 60, and your gearing would have to be correspondingly altered. If you have the water, use more on the 48 inch wheel, or get a 48 inch wheel that will use more water; in this case you would not have to alter your gearing; with either a 48 inch or 60 inch wheel you must use more water to get more power.

(6) R. W. M. writes: Some time ago I asked you how to take copies of a medal by a plaster of Paris mould. You referred me to SCIENTIFIC AMERICAN SUPPLEMENT No. 17, which I ordered at a book store and duly received. I made a mould of plaster of Paris according to directions, and made an alloy of four parts tin and one part antimony as directed, but I can get hardly any impression at all, and all along the edge of the medal which I cast is full of superfluous metal, and thus the edge is not round, as it ought to be. Would you please tell me through your paper (SCIENTIFIC AMERICAN) how to get the impression and not have the superfluous metal on the edge of the medal? Please answer as soon as possible. A. Your composition is not fluid enough for medals. A composition of 69 parts lead, 15 parts antimony, 16 parts bismuth or old type, will make a fair cast. Fusible alloy, 19 parts tin, 13 parts lead, 40 parts bismuth, makes a better and finer impression and more suitable for plaster moulds. Make the plaster casts of each side of the medal separate. Trim and solder the pieces together with a fusible alloy that melts in boiling water. You can only get rid of the fins on the edge by careful moulding and dressing down the face of the mould

(7) J. H. F. writes: My boy has asked me to explain "why his whip cracks." If you see fit to answer in Notes and Queries, I would be pleased. A. The doubling of the lash itself produces an accelerating speed in the cracker, so that by the time it arrives at the end of its stroke, its velocity is very great. Its sudden check and return produces a blow upon the air of great intensity which we hear and designate as a crack. The form of the lash, its gradual taper and the tipping with a small, fibrous, braided and knotted end are mechanical devices for facilitating the action of the lash, and for wear. The fibrous or frayed end adds much to the strength of the "crack" by spreading a large area to act upon the air.

(8) W. writes: Please give me your estimate of the value of a spring I have, and its capacity. The water is never failing, it fills a 3 inch pipe, and has a fall of nearly 100 feet. What horse power will it furnish for small machinery, such as sewing machines, elevators, electric light, etc.? Would there be power sufficient to unload vessels from a wharf? A. We call the head 100 feet, and supplying all the water which will pass through a 3 inch pipe under this head, you should get about 30 horse power with a good turbine wheel.

(9) F. K. asks: What is the best to burn in a small steam engine to heat water for generating steam? I want to use some kind of oil, but don't know which would be the best. A. For very small engines good cold strained lard oil is the best and safest. A boiler large enough to require from one to four full size kerosene lamps can be arranged with metallic chimney for the whole so as to avoid the use of glass. This is done in the kerosene cooking stoves, which you may find on sale at the hardware or stove stores. An inspection of one may put you upon the right track for your wants.

(10) T. A. S. writes: I have noticed one or two inquiries relative to the destruction of red ants. Your readers can rely upon the fact that five cents' worth of powdered borax will drive them all away. There is no danger in this method, and a spoonful sprinkled anywhere infested by them will give your correspondents every satisfaction.

(11) E. M. asks: Is there more power in two cylinders 2 inches bore, 3½ inches stroke each, both working on same shaft, than a cylinder 4 inches bore, 4½ inches stroke? And what is the difference in steam space and power? A party claims more power in the two cylinders on account of double or 7 inch stroke. A. Working at the same speed and under the same pressure, the 4 inch cylinder by 4½ inches stroke is more than double the power of two cylinders 2 inches diameter by 3½ inches stroke.

(12) F. C. S. asks: What is hydrofluoric acid? A. Hydrofluoric acid is the chemical compound arising from the decomposition of calcium fluoride (fluorspar) by concentrated sulphuric acid. It can be procured through any wholesale druggist.

(13) J. W. B. asks: Does a rain gauge, or say a tin bucket, catch as much water in a given length of time if the water falls obliquely as if it falls perpendicularly, the vessel to stand level? A. It does not; but as the wind does not blow steadily in force or direction, no permanent inclination will satisfy the requirements. Experiments have been made on swing gauges much after the style of a marine compass, so that the force of the wind would tip the gauge to face the falling rain. They did not prove altogether satisfactory, and we do not know that there is any now in use.

(14) G. M. E. asks what the pressure of wind is to the square foot going at the rate of 25, 50, and 100 miles an hour. A. According to Wolff's table:

25 miles	2·97	lb. per sqr. ft.
50 "	11·9	"
80 "	30·8	"

According to Smeaton:

25 miles	3·1	lb. per sqr. ft.
50 "	12·5	"
80 "	32	"
100 "	50	"

COMMUNICATIONS RECEIVED.

On Safety Lamps. By W. B.
On Hotel Fires. By J. K.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 21, 1883.

AND EACH BEARING THAT DATE.

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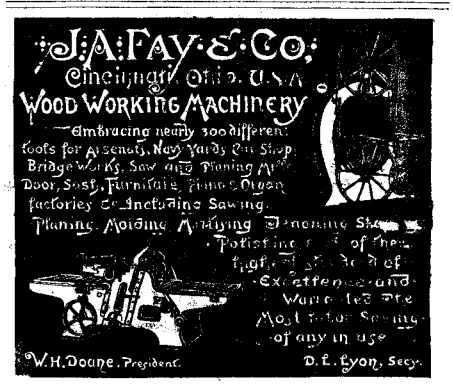

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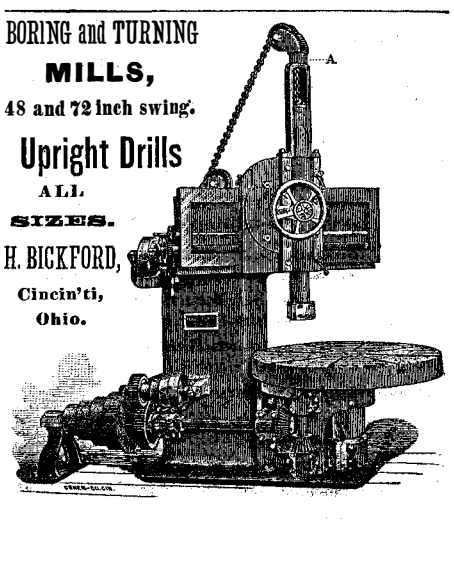

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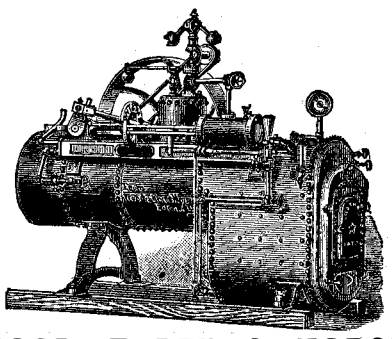

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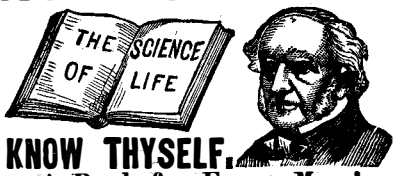

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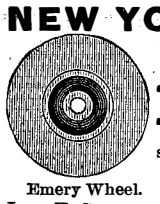
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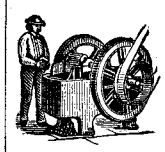
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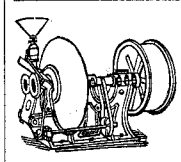
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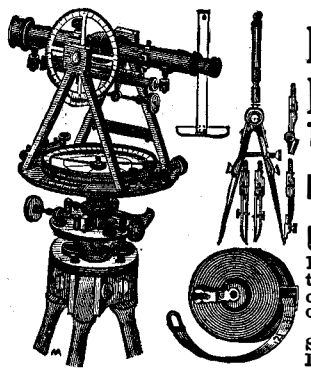
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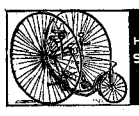
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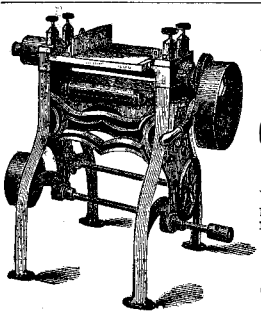
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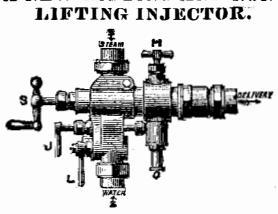
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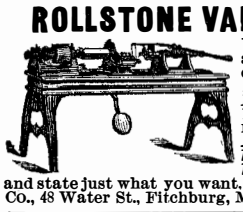
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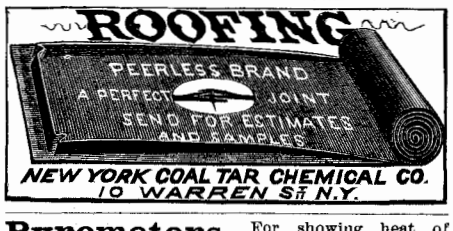

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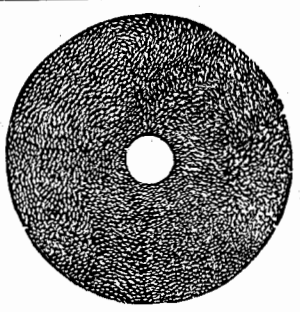
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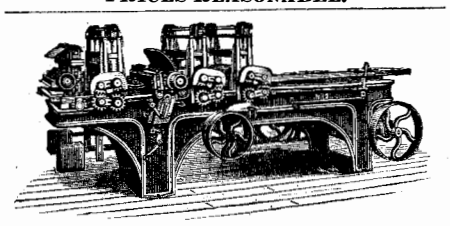
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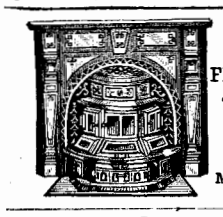
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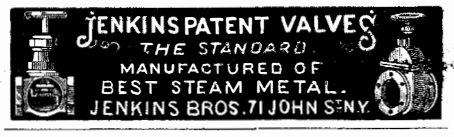

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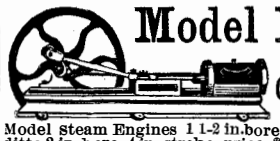
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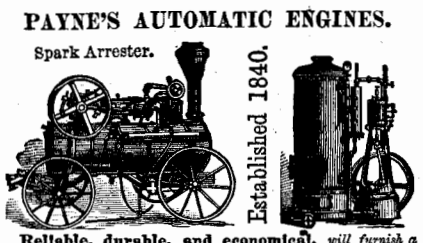

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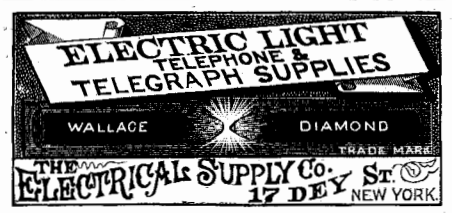

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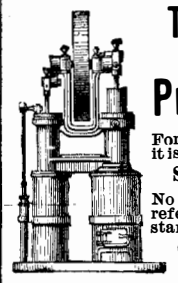
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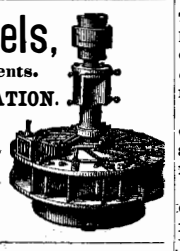

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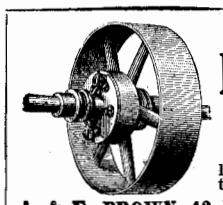
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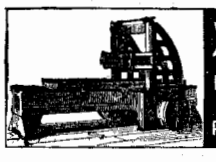

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